THIRD
FIVE YEAR REVIEW REPORT

OTT/STORY/CORDOVA SUPERFUND SITE

MUSKEGON COUNTY, DALTON TOWNSHIP,
MUSKEGON, MICHIGAN

Pursuant to CERCLA
42 U.S.C., Section 9621

Prepared by:
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Region 5
Chicago, Illinois

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Superfund Division, U.S. EPA Region 5

Date:

9-19-07

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ACRONYMS

Agencies	U.S. EPA and MDEQ
ARARs	Applicable or Relevant and Appropriate Requirements
BV	Black and Veatch (contractor)
CFR	Code of Federal Regulations
FS	Feasibility Study
FTCH	Fishbeck, Thompson, Carr, and Huber (contractor)
gpm	gallons per minute
IC	Institutional Control
MCL	Maximum Contaminant Level
MDEQ	Michigan Department of Environmental Quality
mg/kg	milligrams per kilogram
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&F	Operational and Functional
O&M	Operation and Maintenance
PCOR	Preliminary Closeout Report
ppb	parts per billion
ppm	parts per million
PRP	Potentially Responsible Party
RA	Remedial Action
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation/ Feasibility Study
ROD	Record of Decision
Site	Ott/Story/Cordova Superfund Site
The State	The State of Michigan
USACE	United States Army Corps of Engineers
U.S. EPA	United States Environmental Protection Agency
UU/UE	Unrestricted Use/ Unlimited Exposure
μg/L	micrograms per Liter, or parts per billion
VOCs	Volatile Organic Compounds

EXECUTIVE SUMMARY

The Ott/Story/Cordova Site is an approximately 120 acre former chemical production facility in Dalton Township, Muskegon County, Michigan. The implemented remedy consists of groundwater extraction using wells, treatment of extracted contaminated groundwater by a groundwater treatment facility, and removal of contaminated soil with off-site disposal.

The Site-wide remedy at the Ott/Story/Cordova Site currently protects human health and the environment in the short term because groundwater exposure pathways that could result in unacceptable risks are being controlled with groundwater containment through extraction. In addition, excavation of contaminated soil in O.U. #3 has eliminated contaminated soil exposure pathways. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: 1) attainment of groundwater cleanup goals through pump and treat technology, which is now expected to require no less than 23 more years to achieve; and 2) implementation of institutional controls restricting groundwater use to prevent exposure to contaminated groundwater at potentially affected properties located between the Ott/Story/Cordova Site property and Little Bear Creek to the southeast.

The remedy at Operable Unit #1 / #2 of the Ott/Story/Cordova Site is considered protective in the short-term, because there is no evidence that there is current exposure. However, in order for the remedy to remain protective in the long-term, the following actions need to be taken: 1) attainment of groundwater cleanup goals through pump and treat technology, which is now expected to require no less than 23 more years to achieve; and 2) an evaluation of the effectiveness of current institutional controls to prevent exposure to contaminated groundwater at potentially affected properties located between the Ott/Story/Cordova Site property and Little Bear Creek to the southeast and, if necessary and feasible, development and implementation of additional institutional controls for these properties. The remedy at Operable Unit #3 of the Ott/Story/Cordova Site is considered protective of human health and the environment provided the O.U. #3 property is restricted to use compatible with the limited industrial land use category as defined in Section 20120a(1) of Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

Institutional controls (ICs) in the form of restrictive covenants have been implemented by the former Site property owner. Except for operation and maintenance (O&M) and long-term monitoring, remedy work was certified complete in March 2002. Threats at the Site have been addressed through: removal of contaminated soil, continued capture and extraction of contaminated groundwater before reaching Little Bear Creek , and treatment of that contaminated groundwater in a groundwater treatment facility. The Site achieved construction completion with the signing of the Preliminary Close Out Report on May 1, 2002. The triggering actions for this five-year review are the first Five Year Review Report of August 13, 1997, and the second Five Year Review Report of September 19, 2002. The assessment of this five-year review found that the remedy

was constructed in accordance with the requirements of the Records of Decision. An amendment to the Operable Unit (O.U.) #3 Record of Decision was issued to reflect reasonably anticipated future land use of the Site and incorporate revised State of Michigan cleanup criteria.

The following issues were identified during the five-year review process and the Ott/Story/Cordova Site inspection, and impact the long-term protectiveness of the remedy:

1. At the time of the 2002 five-year review, a recommendation was made for a detailed assessment of the O.U. #1 / O.U. #2 remedy (including a more definitive time estimate to reach cleanup standards) with the intent of possibly modifying the remedy. It was recommended that the remedy requirements be adjusted to better reflect completed remedy work (decreased contamination) as well as cost and cleanup effectiveness. The detailed assessment was not completed because of the unknown status of transfer of the Site property to Muskegon County and the County's final intentions for property re-development. The detailed assessment needs to be completed and will include an assessment of a deep well in the former production area (O.U. #3) that was possibly used to inject contaminated material, a further extent of contamination characterization of the semi-confined aquifer, and a capture zone analysis that includes hydraulic and chemical evaluations. Based on the results of the assessment potential future response actions may need to be considered.

2. No ROD Amendment or ESD could be developed previously without this detailed assessment. Further, Muskegon County could not make any determinations about property re-development until they identified and obtained resources to improve the Site property for sale. It was not until 2005-2006 that the County received a grant from the Department of Labor. Because the O.U. #3 remedy work has been successfully completed by MDEQ, this re-development is not inconsistent with the reasonable future industrial land use established by MDEQ.

3. The groundwater downgradient of the Site is not anticipated to reach cleanup standards for many years. To prevent exposure to contaminated groundwater that may present a health risk, groundwater use restrictions are necessary for potentially affected properties located between the Ott/Story/Cordova Site property and Little Bear Creek and its unnamed tributary to the southeast. Within 6 months of the signing of this Five Year Review Report, U.S. EPA and MDEQ will develop an IC Plan to investigate and identify options for ICs on off-site properties potentially affected by contaminated groundwater. Existing or new ICs must be researched, investigated, and a strategy developed for implementation. If ICs current existed the agencies will confirm that they are sufficient.

Five Year Review Summary Form		
Site name *(from WasteLAN)*: Ott/Story/Cordova		
EPA ID *(from WasteLAN)*: MID 060 174 240		
Region: 5	**State:** MI	**City/County:** Muskegon, Egelston Township, Muskegon County
SITE STATUS		
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete		
Multiple OUs?* ☒ YES ☐ NO	**Construction completion date:** May 1, 2002	
Has site been put into reuse? ☐ YES ☒ NO		
REVIEW STATUS		
Lead agency: ☒ EPA ☐ State ☐ Tribe Other Federal Agency _____		
Author name: John V. Fagiolo		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA	
Review period: January 5, 2007 to July 31, 2007		
Date(s) of site inspection: August 1, 2007		
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☐ 2 (second) ☒ 3 (third) ☐ Other (specify) _____		
Triggering action: ☐ Actual RA Onsite Construction ☒ Actual RA Start ☐ Construction Completion ☐ Previous Five Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: September 19, 2002		
Due date *(five years after triggering action date)*: September 19, 2007		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five Year Review in WasteLAN.]

Issues:

a. Detailed assessment of the O.U. #1 / O.U. #2 remedy is needed, including: the calculation of a more definitive time estimate to reach cleanup standards, confirmation of groundwater contaminant plume boundaries, assessment of a deep well in the former production area that was possibly used to inject contaminated material (to determine a response action), a further "extent of contamination" characterization of the semi-confined aquifer, and a capture zone analysis that includes hydraulic and chemical evaluations.

b. Depending upon the outcome of the detailed assessment of the O.U. #1 / O.U. #2 remedy, a ROD Amendment or ESD may be necessary.

c. Long-term stewardship must be assured which includes implementing, maintaining and monitoring effective ICs. This involves evaluating existing ICs at the Site and the current ordinance, exploring whether additional ICs are required for potentially affected properties between the Site property and Little Bear Creek, and planning for long-term stewardship.

Five Year Review Summary Form, cont'd.

Recommendations and Follow-up Actions:

a. Complete Detailed Assessment of O.U. #1 / O.U. #2 Remedy in the form of a Remedial Strategy Analysis.

b. Depending upon the findings of the Remedial Strategy Analysis, issue a ROD Amendment or ESD.

c. Prepare an IC Plan to plan for IC evaluation activities, including: review of existing ICs on and off the Site, identification of appropriate ICs for affected properties between the Site property and Little Bear Creek (to determine whether additional ICs are required and feasible), and assuring effective long-term stewardship procedures by documenting them in a written plan. If needed, EPA and MDEQ will work with individual property owners to implement ICs.

Protectiveness Statement(s):

The Site-wide remedy at the Ott/Story/Cordova Site currently protects human health and the environment in the short term because O.U. #1 / O.U. #2 groundwater exposure pathways that could result in unacceptable risks are being controlled with groundwater containment through extraction, and excavation of contaminated soil in the O.U. #3 area has eliminated contaminated soil exposure pathways. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: 1) attainment of groundwater cleanup goals through pump and treat technology, which is now expected to require no less than 23 more years to achieve; and 2) compliance with effective ICs. Compliance will be assured by: reviewing the existing ordinance to assure its effectiveness, determining whether additional ICs are needed, implementing ICs restricting groundwater use to prevent exposure to contaminated groundwater at potentially affected properties between the Ott/Story/Cordova Site property and Little Bear Creek, and planning for long-term stewardship in order to ensure ICs are maintained and monitored.

The remedy at Operable Unit #1 / #2 of the Ott/Story/Cordova Site is considered protective in the short-term, because there is no evidence that there is current exposure. However, in order for the remedy to remain protective in the long-term, the following actions need to be taken: 1) attainment of groundwater cleanup goals through pump and treat technology, which is now expected to require no less than 23 more years to achieve; and 2) compliance with effective ICs. Compliance will be assured by: reviewing the existing ordinance to assure its effectiveness, determining whether additional ICs are needed, implementing ICs restricting groundwater use to prevent exposure to contaminated groundwater at potentially affected properties between the Ott/Story/Cordova Site property and Little Bear Creek, and planning for long-term stewardship in order to ensure ICs are maintained and monitored.

The remedy at Operable Unit #3 of the Ott/Story/Cordova Site is considered protective of human health and the environment provided the O.U. #3 property is restricted to use compatible with the limited industrial land use category as defined in Section 20120a(1) of Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. ICs have been implemented for the O.U. #3 area to limit land and ground water use. Long- term protectiveness requires compliance with effective ICs. Compliance will be assured by reviewing ICs for effectiveness along with procedures for maintaining and monitoring ICs.

I. INTRODUCTION

The purpose of five-year reviews is to determine whether the remedy at a site is expected to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

The Agency is preparing this five-year review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The agency interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The United States Environmental Protection Agency (U.S. EPA) conducted this statutory review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Section 121(c), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Contingency Plan (NCP) Section 300.400(f)(4)(ii), and OSWER Directives 9355.7-02 (dated May 23, 1991), 9355.7-02A (dated July 26, 1994), and 9355.7-03B-P (dated *June 2001*).

This five-year review covers all three Operable Units (O.U.) at the Site: O.U.#1 which addressed containment of contaminated groundwater, O.U. #2 which addressed additional groundwater containment and treatment of captured groundwater, and O.U.#3 which addressed contaminated soils and sediment. This review and supporting documentation will become part of the Site record and copies will be placed in the Administrative Record and local repository for the Ott/Story/Cordova Superfund Site in Muskegon, Michigan. This Five Year Review Report has been prepared by the

U.S. EPA Remedial Project Manager using U.S. EPA project documents and information supplied by U.S. EPA's contractors, Fishbeck, Thompson, Carr, and Huber (FTCH), Black and Veatch (BV), by the U.S. Army Corps of Engineers (USACE), and with consultation by the Michigan Department of Environmental Quality (MDEQ). This is the third five-year review. The triggering actions are the first five-year review of August 13, 1997 and the second five-year review of September 19, 2002.

II. SITE CHRONOLOGY

Table 1 summarizes the chronology of events for the Ott/Story/Cordova Site.

TABLE 1 - OTT/STORY/CORDOVA SITE CHRONOLOGY

Aug., 1982	Hazard Ranking System (HRS) assessment conducted by U.S. EPA.
Sept., 1982	Ott/Story/Cordova Site included on the National Priorities List (NPL).
Sept., 1989	RI/FS completed.
Sept. 29, 1989	O.U. #1 ROD signed by U.S. EPA Regional Administrator.
Mar. 3, 1990	O.U. #1 ROD affirmed by U.S. EPA Regional Administrator after re-opening of the ROD and public comment period.
Sept. 29, 1990	O.U. #2 ROD signed by U.S. EPA Regional Administrator.
Feb., 1991	Remedial Design (RD) of O.U. #2 GWTF started by USACE.
Aug. 27, 1991	Western District Court rules in favor of U.S. EPA.
Sept., 1991	Notice to proceed given to USACE for negotiation of access easements for extraction well installation.
Sept. 29, 1992	U.S. EPA Region 5 receives $250,000 settlement from Dr. Ott.
May 10, 1993	U.S. EPA terminates Administrative Orders and proceeds with remedy.
Sept. 23, 1993	O.U. #3 ROD for Low Temperature Thermal Desorption (LTTD) signed by U.S. EPA Regional Administrator.
Oct., 1993	GWTF design completed and construction started.
Apr., 1995	Extraction well installation started.
May, 1995	LTTD remedy design completed and construction started.
July, 1995	U.S. EPA directs USACE to stop O.U. #3 LTTD work because of recommendations by Potentially Responsible Parties (PRPs)
July 14, 1995	U.S. Sixth Circuit Court rules in favor of PRPs.
Sept., 1995	Extraction well installation and development completed.
Feb. 2, 1996	GWTF begins treating contaminated groundwater.
June, 1996	GWTF start-up problems require extension of construction and shakedown contract. Documents for funding approvals initiated.
Sept., 1996	General contractor completes on-site leak testing of GWTF process equipment as required by USACE.
Feb., 1997	Funding for extension of shakedown period is approved by Region 5 Regional Administrator.

May 13, 1997	U.S. Sixth Circuit Court rules in favor of PRPs.
June, 1997	Extraction well fouling and reduced operation due to Site hydrogeology prevents full flow of groundwater to GWTF. Limited capacity through GWTF prevents testing at full flow. Decision is made to develop and initiate extraction well preventive maintenance, cleaning, and repair program and extend construction and shakedown contract. Documents for funding approval initiated.
Aug. 13, 1997	Five Year Review (Type Ia) completed by U.S. EPA.
Aug. 22, 1997	U.S. EPA and MDEQ (the "Agencies") perform first informal GWTF walk-through 18 months after commencement of water treatment. Extraction well repair and cleaning continues.
Sept., 1997	IAG amendment is approved by Region 5 Regional Administrator.
Feb. 26, 1998	O.U. #3 ROD Amendment approved by Region 5 Superfund Division.
March, 1998	After performing an analysis and considering all alternatives to alleviate GWTF flow problem, a decision is made that construction of a new, 3 mile larger treated water effluent pipe line is necessary. Documents for IAG Amendment initiated.
May, 1998	Negotiations with property owners (including municipalities and railroad) to obtain access easements for new effluent pipe line construction begin.
June 8, 1988	U.S. Supreme Court rules in favor of U.S. EPA.
Oct. 22, 1998	U.S. EPA and MDEQ perform second informal GWTF walk-through.
Jan., 1999	Easement and property access issues for effluent pipe line construction are resolved.
March, 1999	Notice to proceed is given for construction of new effluent line.
April 14, 1999	Consent Decree is signed by U.S. EPA that requires Aerojet / Cordova to complete the amended O.U. #3 remedy
Aug. 11, 1999	Start-up of new, larger 3 mile treated water effluent pipe line.
Aug. 26, 1999	First contract for LTRA / O&M is awarded, with four contract option years.
Aug. 9, 2000	U.S. EPA and MDEQ concur to declare the O.U. #1 O.U.#2 GWTF operational and functional.
Feb., 2001	MDEQ approves Final Design for O.U. #3 building demolition and soil excavation, and proceeds with contract bidding procedures.
Oct., 2001	Contractor mobilizes for O.U. #3 building demolition and soil excavation.
Nov. 9, 2001	U.S. District Court in Grand Rapids, MI found the remaining viable PRP not liable on all counts, signifying that U.S. EPA and MDEQ are to fund the Site remedies.
Mar., 2002	Pre-Final Inspection of O.U. #3 areas (Areas F, G, R certified complete).
May 1, 2002	Preliminary Closeout Report signed by Superfund Division Director.
Sept. 19, 2002	Second Five Year Review Report signed by Superfund Division Director.
Aug. 26, 2004	Second contract for LTRA / O&M is awarded, with four contract option years.
Aug. 9, 2005	Second five years of LTRA begins. State take-over to occur in September 2010.
January 2007	The process for the third Site five-year review begins.
August 3, 2007	Notice of the five-year review is published in the Muskegon Chronicle.

III. BACKGROUND

III.A. Physical Characteristics

The Ott/Story/Cordova Site consists of approximately 120 acres generally located at 500 Agard Road in Section 32, Township 11 North, Range 16 West, Dalton Township, Muskegon County, Michigan (see Figure 1). The Site has been divided into three operable units: O.U. #1 is the groundwater extraction system intended to protect the Creek; O.U. #2 is a continuation of O.U. #1 and requires restoration of the groundwater aquifer including construction of a groundwater treatment facility (GWTF) to treat extracted groundwater; and O.U. #3 is contaminated soil within the former plant area.

III.B. Land and Resource Use

The Site is a former specialty organic chemical production facility that operated under a series of owners from 1957 until 1985. The disposal of both industrial wastewaters and residuals from chemical production in unlined seepage lagoons resulted in contamination of: an aquifer below and downgradient of the Site, Site soils, and nearby Little Bear Creek (the "Creek") and its unnamed tributary. If not contained, the contaminated groundwater discharges into the Creek system, located about one mile southeast of the Site, contributing to degradation of this surface water body. Residences in the immediate area of the Site are connected to the local public water system and groundwater is not used for potable uses. Little Bear Creek is a designated trout stream and a tributary to Bear Creek. In 2002, after liability issues had been resolved and appropriate deed notices and land use restrictions had been implemented, Cordova Chemical sold the Site real estate to the Muskegon County government. Muskegon County is currently improving the infrastructure of the Site property and surrounding real estate and intends to sell the property as separate parcels for eventual industrial use. No schedule has been developed yet for property sales, but general Site work such as clearing and grubbing of vegetation and installing an access road will start later in 2007. The Site property is currently zoned industrial.

III.C. History of Contamination

A number of companies manufactured chemicals at the Site for approximately 30 years. From 1957 to 1972, the Ott Chemical Company owned and operated the Site. In 1965, a subsidiary of CPC International (later known as Best Foods, and since purchased by Unilever Inc.), owned and operated the Site. From 1972 to 1977, Story Chemical Co. owned and operated the Site until Story filed for bankruptcy in 1976. From 1977 to 2002, the Site has been owned and operated by Cordova Chemical Company of Michigan and Cordova Chemical Company of California, both of which are wholly owned subsidiaries of Aerojet-General. The Site property is now owned by the County of Muskegon.

The former chemical plant area of the Site occupies approximately 20 acres. Site contamination includes benzene, trichloroethylene, toluene, vinyl chloride, arsenic, PCBs, and tetrachloroethylene. At one point approximately 8,700 drums were on-site, as well as thousands of cubic yards of contaminated sludge.

III.D. Initial Responses

A partial removal was conducted at the Site between 1977 and 1979 by the State of Michigan (the "State") with the assistance of the new and present Site owner Cordova Chemical Company. Cordova agreed to neutralize and dispose of phosgene gas and pay the State to address other problems at the Site. Removal activities included removal of stockpiled drums and thousands of cubic yards of contaminated soils and sludge. By the time of the removal, a contaminant plume containing at least 40 organic chemicals had migrated to the southeast, contaminating Little Bear Creek, its unnamed tributary, and several private wells. Residents were supplied with bottled water until connections to the municipal water system were installed in 1982. The Site was placed on the National Priorities List (NPL) in 1982 and U.S. EPA completed a Remedial Investigation and Feasibility Study (RI/FS) in 1990.

III.E Basis For Taking Action

III.E.1. Operable Units #1 and #2 - Groundwater

The O.U. #1 and O.U. #2 Records of Decision provided the following discussions of the risk at the Site associated with the Site's contaminated groundwater:

> "The chronic hazard index value exceeded unity in 19 monitoring wells. Consequently, were groundwater used in its present state, there is a health risk with regard to noncarcinogenic chemicals ..."
>
> "With regard to carcinogenic indicator chemicals, cancer risks for at least one compound exceeded $1x10^{-6}$ in 22 wells. ....Additive excess cancer risk... is approximately $9x10^{-4}$, primarily from 1,2 - Dichloroethane, Vinyl Chloride, and Tetrachloroethane ... Primarily due to the known human carcinogen Vinyl Chloride, excess cancer risk associated with groundwater ingestion at well B1 is $4x10^{-2}$; at well OW-8 such risk is in excess of $1x10^{-1}$"

Table 2 provides a limited comparison of contaminants found in Site groundwater, cited in the O.U. #1 and O.U. #2 RODs. Table 2 compares this information against recent sampling data and against the cleanup standards required by the RODs. This table is a limited comparison because there were additional contaminants discovered since the Records of Decision, making a direct comparison not possible.

As part of this five-year review, an analysis of 10 years of Site groundwater data was performed by U.S. EPA Region 5's Advanced Analysis and Decision Support Section.

Conclusions are not yet final but in general the analyses performed indicate that concentrations of the principal contaminants of concern are declining in most wells. In some cases, where data suggests a possible exceedance of cleanup standards, these appear to be generally located at monitoring wells upgradient of extraction wells, closer to the O.U. #3 area. Analytic capture zone calculations were performed and in general, the extraction wells are successfully extracting contaminants. Analyses indicate the system as designed is adequately sized to accomplish the remedial objectives and capture composite target zones of contamination. Further analysis of the system will help with specific re-balancing of groundwater extraction rates to provide added assurance of capture integrity, and will help determine if one or more new monitoring wells are needed to confirm that all areas are being remediated in the most effective way. In addition, results of the analysis will be used to better estimate cleanup times. A final report of findings will be available in December 2007.

III.E.2. Operable Unit #3 - Soils and Sediment

Excavation of contaminated soil in the O.U. #3 area was completed in early 2002. Table 3 shows the State of Michigan cleanup standards that were achieved and the maximum contaminant concentration found in the areas that were excavated.

Tables 4 and 5 show the type and maximum concentration of contaminants discovered in the water and sediments of Little Bear Creek and its unnamed tributary (Figure 3). Removal of contaminated sediment will not occur unless monitoring data suggests removal is necessary. MDEQ has sampled sediments in Little Bear Creek and its unnamed tributary since 2002 and has found that there are no contaminants at unacceptable concentrations available to any person who uses the Creek for recreational purposes.

Table 6 summarizes all risks that were associated with the contaminated soil formerly in O.U. #3 areas. As shown, the greatest risks associated with O.U. #3 were to a future resident ($3x10^{-4}$; Hazard Index (HI) of 2.4) and future worker ($1x10^{-4}$). Consideration of all the contaminants found on-site resulted in the greatest risk to a future Site worker ($1.5x10^{-4}$), a future maintenance worker ($2.0x10^{-4}$), and a future resident ($5.8x10^{-4}$). Risk values shown in Table 6 also considered the likelihood of a future Site resident or visitor being exposed to both plant area soils and/or Creek water and sediments. Risk shown in Table 6 has been addressed by the O.U. #3 Remedial Action excavation which was certified complete in March 2002.

IV. REMEDIAL ACTIONS

IV.A REMEDY SELECTION

IV.A.1 Remedy Selection - Operable Unit #1

A Record of Decision (ROD) for O.U. #1 was signed September 29, 1989. At the request of certain parties, U.S. EPA re-opened and affirmed the remedy selected by this ROD on March 3, 1990. Remedy requirements as discussed in the O.U. #1 ROD are:

1. installation of extraction wells to intercept flow of contaminated groundwater which would otherwise enter the Little Bear Creek system;
2. environmental monitoring to ensure the effectiveness of the remedial action; and
3. provision for adequate treatment of groundwaters thus collected such that the resultant discharge will meet National Pollutant Discharge Elimination System (NPDES) limitations as imposed by the program administered by the Michigan Department of Environmental Quality (MDEQ).

The specific language in the ROD for O.U. #1 Remedial Action Objectives is:

> RESPONSE OBJECTIVES: The response objectives for this operable unit are to intercept and contain contaminated groundwater within the unconfined groundwater system, eliminate potential surface water and air exposure routes by preventing contaminated groundwater discharge into Little Bear Creek and its unnamed tributary, and to ensure that this operable unit is fundamentally compatible with future remedial actions at the Ott/Story/Cordova Site. In determining an acceptable stream effluent, the applicable or relevant and appropriate requirements (ARARs) of environmental laws were reviewed. These values are presented on page 41 (of the ROD) as "Michigan Limits on Stream Discharge' (Act 245, Part 21; Rule 57). The intrusion of contaminated groundwater into Little Bear Creek and its unnamed tributary has resulted in the degradation of portions of those bodies of water. Undertaking the selected remedy will bring about a recovery in stream quality, and will also reduce risk associated with contact with surface water and inhalation of volatile organics.

IV.A.2 Remedy Selection - Operable Unit #2

A ROD for O.U. #2 was signed September 29, 1990 and is a continuation of the O.U. #1 remedy. Remedy requirements as discussed in the O.U. #2 ROD are:

1. phased installation and operation of extraction wells designed to restore the aquifer and prevent degradation of useable groundwater resources at the southern boundary (downgradient edge) of the plume of contamination;

2. installation and operation of a purge and treatment system at points in the unconfined and semiconfined aquifer system specifically designed:
   a. to halt movement of the contaminated groundwater plume;
   b. to reduce pollutant mass;
   c. to restore the aquifer to useable conditions, specifically to acceptable Federal or State standards, whichever are more stringent;
   d. to be sufficiently flexible to allow modifications of the design of the purge system based upon operating experience; and
   e. to allow for continued definition of the extent of groundwater contamination;
3. installation of a groundwater monitoring system that:
   a. demonstrates the effectiveness of the aquifer restoration;
   b. demonstrates complete capture and treatment of the groundwater plume;
   c. identifies the most efficient locations for extraction wells; and
   d. is capable of determining when the aquifer is sufficiently restored to allow wells to be taken out of service; and
4. provision for adequate treatment of groundwater by construction of a Groundwater Treatment Facility (GWTF) such that the resultant discharge will meet requirements determined by the authorized State of Michigan program, specifically NPDES discharge limitations as administered by MDEQ.

The remedy goal included in the O.U. #2 ROD is restoration of the aquifer to National Primary Drinking Water Standards required by the Safe Drinking Water Act (40 CFR 141), or standards required by Act 307 of the Michigan Environmental Response Act ("Act 307") whichever are more stringent. 40 CFR 141 specifies maximum chemical contaminant levels (MCLs) for inorganic and organic chemicals. The standards required by Act 307 have since been replaced by Part 201 of the Natural Resources and Environmental Protection Act (Environmental Remediation), PA 451 of 1994, as amended ("Part 201").

IV.A.3 Remedy Selection - Operable Unit #3

The goal of O.U. #3 remedy work is to reduce infiltration through contaminated soils which may add to the burden of groundwater contamination to be dealt with by O.U. #1 and O.U. #2 and to eliminate the primary human health risks posed by direct contact with contaminated soil; and to eliminate the threat to the environment.

1. A ROD for O.U. #3 was signed September 27, 1993, to address plant area soils (source contamination) and sediment in Little Bear Creek and its unnamed tributary. Remedy requirements as discussed in the O.U.#3 ROD were:
   a. excavation of contaminated soils/sediments;
   b. treatment of such materials using low temperature thermal desorption (LTTD);
   c. on-site backfilling of treated soils which meet soil cleanup criteria consistent with a future residential land use scenario;
   d. off-site disposal of treated soils which do not attain cleanup criteria; and
   e. environmental monitoring to ensure cleanup criteria are attained.

2. An amendment to the O.U. #3 ROD (the "O.U. #3 ROD Amendment") was signed February 26, 1998, and changed the remedy to reflect reasonably anticipated future land use of the Site and to incorporate revised State of Michigan cleanup criteria. Remedy requirements as discussed in the O.U. #3 ROD Amendment are:
   a. elimination of the need for LTTD;
   b. excavation of a lesser volume of soils to meet acceptable State soil cleanup standards and off-site disposal;
   c. regular sampling of surface water and sediments to determine the need for remedial action in the Little Bear Creek system in addition to the original environmental monitoring to ensure cleanup criteria are attained; and
   d. implementation of deed restrictions in the form of restrictive covenants to insure that use of the Site remains industrial. These deed restrictions have been recorded with the Muskegon County Register of Deeds.

Revision of State cleanup standards resulted in a reduction in the volume of soil requiring remediation at the Site. In addition, based on information acquired after the 1993 ROD, a high potential for re-contamination of treated soils by contaminated groundwater would remain under the original LTTD remedy, thereby calling into question the effectiveness of treatment and on-site disposal. After evaluating remediation goals of the O.U. #3 ROD and reasonable future land use, it was concluded that it is more feasible to restore the Site for future industrial use. The remedy goal discussed in the O.U. #3 ROD was soil cleanup standards required by Act 307, which has since been replaced by Part 201. This change in the Michigan soil cleanup standards was accounted for by the O.U. #3 ROD Amendment. Except for limited operation and maintenance (O&M) and possible long-term monitoring, O.U. #3 remedy work was certified complete in March 2002.

IV.A.4 Enforcement Activity

Pursuant to CERCLA § 122, U.S. EPA issued Special Notice letters to Potentially Responsible Parties (PRPs) on October 15, 1982, August 2, 1985, and May 9, 1989. The major PRPs at the Site included Dr. Arnold Ott, Corn Products Company (or CPC International, later known as Best Foods, and since purchased by Unilever Inc.), and Aerojet-General, owner of Cordova Chemical.

On March 12, 1990, U.S. EPA issued a unilateral order (UAO) pursuant to CERCLA § 106 to Aerojet and CPC to implement a remedial design (RD) and remedial action (RA) for O.U. #1. Both Aerojet and CPC refused to comply with that UAO. On February 4, 1991, U.S. EPA issued a second UAO to Aerojet and CPC to implement RD/RA for O.U. #2. Aerojet and CPC again refused to comply. As a result of Aerojet's and CPC's refusal to comply, U.S. EPA terminated these Administrative Orders on May 10, 1993 and proceeded with the O.U. #1 and O.U. #2 RD and RA using Federal funds. On September 29, 1992, U.S. EPA Region 5 received a $250,000 settlement from Dr. Arnold Ott.

In May and June 1991, the Western District Court of Michigan conducted a fifteen-day bench trial, CPC Int'l Inc. v. Aerojet-General Corp., 777 F. Supp. 549 (W.D. Mich. 1991), to determine which parties were responsible. On August 27, 1991, both Aerojet and CPC were found to be liable under CERCLA §107 by the District Court. An appeal by CPC and Aerojet resulted in a July 14, 1995, 2-1 ruling by a panel of the U.S. Sixth Circuit Court that reversed the District Court determination.

After a petition by the United States and the State of Michigan, the U.S. Sixth Circuit Court of Appeals granted the United States' and the State's request for a rehearing en banc, and on May 13, 1997, in a 7-5 decision, the U.S. Sixth Circuit Court reversed the District Court's decision. The United States and the State then petitioned to the U.S. Supreme Court to grant certiorari review of the case. The U.S. Supreme Court granted certiorari and on March 24, 1998 the case was argued. A June 8, 1998 decision by the U.S. Supreme Court rejected the standard articulated by the Sixth Circuit and set a new standard for establishing when a parent corporation will be considered liable as an operator under CERCLA. The case was remanded back to the District Court for a determination of liability applying the standard set by the Supreme Court. On April 14, 1999, a settlement was reached with Aerojet / Cordova which resolved their liability to both the United States and the State. On Nov. 9, 2001, the District Court found Unilever not liable. As a result, U.S. EPA and the State are responsible for all future remedy work at the Ott/Story/Cordova Site and groundwater.

A 1977 agreement between Cordova and the State of Michigan regarding surface soil, sludge removal, and groundwater contained language wherein the State purported to indemnify Cordova for any future environmental liability. A decision by the Michigan Court of Appeals on July 14, 1995, upheld the indemnification. On April 14, 1999, the U.S. EPA Region 5 Superfund Division Director signed a Consent Decree for completion of the O.U. #3 portion of the Site remedy by Aerojet / Cordova, relieving the U.S. Government of that responsibility. This Consent Decree allowed the State to complete the O.U. #3 portion of the Site remedy on behalf of Aerojet / Cordova. The Consent Decree also resolved Aerojet / Cordova's liability at the Site.

IV.B REMEDY IMPLEMENTATION

IV.B.1 Remedy Implementation - Operable Units #1 and #2

Requirements for the Operable Unit #1 remedy have been incorporated into the O.U. #2 scope. In February 1991, through an Inter-Agency Agreement (IAG), U.S. EPA authorized the U.S. Army Corps of Engineers (USACE) to begin Remedial Design activity. In September 1991, U.S. EPA authorized the USACE to acquire access to property for installation of the O.U. #1 extraction wells. In October 1993, the design of the GWTF was completed and USACE awarded a contract for construction activities for both Operable Units #1 and #2. In February 1996, after appropriate leak testing and initial shakedown activity, treatment of contaminated groundwater started at a reduced

flow rate. Groundwater treatment at GWTF full design flow rate was not possible due to limited capacity of the existing Cordova treated water effluent discharge pipe line that was being used. A new, larger effluent pipeline was constructed to increase the flow of groundwater up to GWTF full design capacity as needed. The GWTF was declared fully operational and functional by U.S. EPA and MDEQ on August 9, 2000.

IV.B.2 Remedy Implementation - Operable Unit #3

In September 1993, the design for the original O.U. #3 LTTD remedy was started by the USACE and completed in April 1995. At that time, a contract was awarded and the Site was prepared for a mobile LTTD unit. In July 1995, LTTD work was halted by U.S. EPA after consideration of recent changes to State of Michigan cleanup standards, increases shown in post-ROD cost estimates, and the fact that contaminated groundwater could permeate treated areas during periods of increased groundwater levels, potentially 're-polluting' clean soils. U.S. EPA issued the O.U. #3 ROD Amendment on February 26, 1998 and after appropriate negotiations, a Consent Decree between U.S. EPA, Cordova, and MDEQ to ensure MDEQ's completion of the O.U. #3 portion of the Site remedy was signed on April 14, 1999. Under MDEQ management, the LTTD design documents were revised to reflect the new requirements for excavation and off-site disposal. Areas F, G, and R, and an additional 6 areas identified by MDEQ to allow re-development of the property were completed ahead of the schedule originally prepared.

IV.B.3 Final Inspection - Certification of Operational and Functional Status

A September 14, 2000 letter was provided by MDEQ certifying its concurrence with the August 9, 2000 declaration of operational and functional (O&F) status for the GWTF and existing extraction wells. For the O.U. #3 soil remedy, a visual inspection of the excavated and filled areas completed by the State of Michigan occurred on Thursday March 21, 2002, making March 21, 2002, the O&F date for the soil removal work portion of the O.U. #3 remedy required by the O.U. #3 Consent Decree. Appropriate quality assurance and quality control was performed during all phases of remedy construction. Throughout the construction activities for all operable units, there has been monitoring of contaminated media. Until an assessment of the remedy goals and possible adjustment of the existing remedy is determined to be necessary by U.S. EPA and MDEQ, there are no remaining requirements for U.S. EPA and successful completion of remedy construction at this Site by U.S. EPA has been achieved.

IV.B.4 Achievement of Remedy Cleanup Goals

Table 2 compares contaminants found in Site groundwater and cited in the O.U. #1 and O.U. #2 RODs against recent sampling data and cleanup standards required by the RODs. Table 7 compares groundwater contaminants cited in the O.U. #1 and O.U. #2 RODs against GWTF influent concentrations, against contaminant levels in treated water, and against discharge permit limits established by MDEQ. Tables 4 and 5 provide a limited chronological history of contaminants found in Creek water and

sediment. All tables are limited comparisons because there have been additional contaminants discovered since the Records of Decision, making a direct comparison not possible.

As shown by these tables, implementation of the O.U. #1 / O.U. #2 remedy has decreased concentration of contaminants in groundwater. Although the O.U. #2 remedy goal is restoration of the groundwater aquifer to useable status, which in effect is achievement of MCLs or Michigan Part 201 standards, the remedy has not yet been operating long enough to realize this goal. It is anticipated based on the contaminant reduction to date that the remedy goal can eventually be achieved. Table 7 shows that the GWTF successfully achieves permit limits and has been in compliance since the start of treatment in 1996.

In March 2002, U.S. EPA performed a final inspection of O.U. #3 soil areas and certified that excavation of contaminated soil and back-filling work was complete. Table 5 shows a decrease in contaminant concentrations in sediment, suggesting that the O.U. #1 / #2 remedy has been successful in capturing contaminated groundwater before it reaches the Creek. Capture of contaminated groundwater has resulted in Creek water and sediment contaminant levels that are lower than the levels cited in the Site Records of Decision. The State of Michigan is required by the O.U. #3 scope of work to monitor surface water and sediment as needed on a long-term basis. The State of Michigan will implement any active remediation effort for Little Bear Creek and its unnamed tributary if it is determined to be necessary in the future.

IV.C Institutional Controls

Institutional controls (ICs) are required to ensure the protectiveness of the remedy. ICs are non-engineered instruments, such as administrative and legal controls that help to minimize the potential for exposure to contamination and that protect the integrity of the remedy. Compliance with ICs is required to assure the long-term protectiveness for any areas which do not allow for unlimited use or unrestricted exposure (UU/UE). ICs are also required to maintain the integrity of the remedy. Table 8 summarizes the IC areas for the Ott/Story/Cordova Site. Figure 6 identifies those areas that do not support unlimited use and unrestricted exposure. Table 8 below summarizes institutional controls for these restricted areas.

In 2002, before transferring ownership to Muskegon County, Cordova Chemical developed and recorded restrictive covenants for all of the property on which the Ott/Story/Cordova Site is located. This includes all of the former production plant areas (O.U. #3), the area where the GWTF is sited, and undeveloped wooded property that surrounds these areas. These Declarations of Restrictive Covenants require the property owner to restrict the uses of the property to uses compatible with the limited industrial land use category as defined in Section 20120a(1) of Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Further, the restrictions prevent use of groundwater underlying the Site and the Declarations state

that they run with the land. As noted previously, Muskegon County or the eventual owner or lessee of the Site property will be required to monitor and maintain ICs as an O&M task, with oversight by U.S. EPA and MDEQ. The property is currently zoned for industrial use.

The groundwater downgradient of the Site is not anticipated to reach cleanup standards for many years. Neither the O.U. #1 nor O.U. #2 ROD included language that required institutional controls on the properties affected by contaminated groundwater as part of the required remedy. However, in describing the selected remedy, the O.U. #2 ROD includes this statement: "...monitoring and institutional controls will assist in evaluating effectiveness of restoration measures." In addition, the O.U. #3 ROD requires: "...imposition of land-usage restrictions as appropriate." To prevent exposure to contaminated groundwater that may present a health risk, groundwater use restrictions are necessary for potentially affected properties located between the Ott/Story/Cordova Site property and Little Bear Creek and its unnamed tributary to the southeast.

Within 6 months of the signing of this Five Year Review Report, U.S. EPA and MDEQ will develop an IC Plan to evaluate the effectiveness of current institutional controls, and investigate and identify options for potential additional ICs on off-site properties potentially affected by contaminated groundwater. Although residences in the area have been connected to a safe drinking water source (the Muskegon County public water system), and there is a local ordinance that requires approval from the Muskegon County Department of Public Health for any new drinking water wells in the area. Existing or new ICs must be researched, investigated, and a strategy developed for implementation. If ICs current existed the agencies will confirm that they are sufficient. Potentially affected off-site properties are located between the former Ott/Story/Cordova property and Little Bear Creek and its unnamed tributary to the southeast.

The IC Plan will contain at a minimum a strategy to obtain the following information:

-- An evaluation of the effectiveness of the current local ordinance that prevents the installation of groundwater wells in the vicinity of the Site property without prior approval of the Muskegon County Department of Public Health to prevent the use of contaminated groundwater for drinking water purposes.

-- An evaluation of current zoning restrictions that may limit the use of groundwater at the Site property and off-site properties potentially affected by groundwater contamination.

-- A map identifying: current boundaries of restricted areas associated with the Site (including the Site property boundary), property ownership boundaries, nearby streets, any easements or encumbrances, and assessor's parcel numbers or other recorded plat or survey information.

-- Legal descriptions of each property that needs to be restricted, according to current American Land Title Association (ALTA) guidelines.

-- Geographic Information System (GIS) coordinates (accuracy of at least 0.01 of a foot) showing the current boundaries of: restricted areas associated with the Site (including the Site property boundary), property ownership boundaries, any easements or encumbrances, and other recorded plat or survey information. GIS coordinates will be certified by a licensed surveyor.

-- Draft restrictive covenants, easements, or servitudes in their substantial form, enforceable under the laws of the State of Michigan for the restricted areas (other than areas already restricted by the ICs implemented by Cordova Chemical).

-- A current title insurance commitment in the form of ALTA Commitment Form-1982 (as amended) from a title company, showing title to the restricted areas to be free and clear of all prior liens and encumbrances (other than areas already restricted by the ICs implemented by Cordova Chemical).

-- Copies of encumbrances referenced in the Title Commitment, including the identification of encumbrances that negatively impact the restricted areas and copies of requests for subrogation agreements for such encumbrances. Encumbrances will be shown on paper and GIS maps depicting parcel numbers and the areas impacted by the encumbrances.

-- If necessary and feasible, a schedule for implementation of the institutional controls.

-- As noted below, to ensure long-term stewardship, any monitoring plans for the Site and affected areas to ensure that ICs are maintained and remain in place as an amendment to the Operation and Maintenance Plan.

For this five-year review, it was confirmed that Site property uses are in compliance with the 2002 Declaration of Restrictive Covenants. Portions of the Site property are fenced, but GWTF operations personnel are present throughout the Site property during normal business hours. Potentially affected properties located between the Site property and Little Bear Creek to the southeast are known to be connected to the local public water system.

Table 8 - Institutional Controls Summary Table
Ott/Story/Cordova; Muskegon, Michigan

Media, Engineered Controls and Areas that do not support UU/UE* for Current Conditions	IC Objective	IC Instrument Implemented
Ott/Story/Cordova Site property boundary (approx. 150 acres). **On-site soil contamination.** Excavated soil areas back-filled with clean soil. Muskegon County is the current Site property owner. There are no indicators of breaches in the back-filled areas. There is no evidence of exposure.	- Limit use of land within the Site property boundary and assure integrity of excavated and back-filled areas and groundwater extraction and treatment system. - Limit on-site excavation and on-site construction to prevent unacceptable exposures to contaminated soil at depth and disturbance of RA components. - Prevent unacceptable disturbance of excavated and back-filled areas. - Prevent transfer of the Site property without notice to regulatory agencies.	Owner's Declaration of Restrictions on Current & Future Uses. Restrictive Covenants that restrict current and future use are in place, run with the land, and were recorded with Muskegon County on June 6, 2002. Restrictive Covenants require the owner to: - restrict uses of the Property to those uses compatible with the limited industrial land use category as defined in Section 20120a(1) of Part 201 of NREPA, - restrict activities that may interfere with response activities, operation and maintenance, monitoring, or other measures necessary to assure the effectiveness and integrity of the remedial action. - manage surface and subsurface soils in accordance with applicable state and federal laws including the requirements of Section 20120c of the NREPA. - maintain the Property fence, with reconfiguration only with approval by MDEQ. - provide notice to the MDEQ of the Owner's intent to convey any interest in the Property fourteen (14) days prior to consummating the conveyance. No conveyance of title, an easement, or other interest in the Property shall be consummated without provision for compliance with the terms and conditions of the Restrictive Covenants. - grant the right to enter the Property at reasonable times to the MDEQ and the EPA and their designated representatives for the purpose of response activities. U.S. EPA and MDEQ monitor the Site to guarantee there is no unacceptable disturbance of Site soils.

Table 8 - Institutional Controls Summary Table
Ott/Story/Cordova; Muskegon, Michigan

Media, Engineered Controls and Areas that do not support UU/UE* for Current Conditions	IC Objective	IC Instrument Implemented
Ott/Story/Cordova Site property boundary (approx. 150 acres). **Groundwater that exceeds cleanup standards underlying Site property. On-site Groundwater (cont'd.)**	- Prohibit use of groundwater underlying the Site. - Limit well installation on the Site property to prevent groundwater use. - Prevent unacceptable exposure from the indoor air pathway.	Owner's Declaration of Restrictions on Current & Future Uses. Restrictive Covenants that restrict current and future use are in place, run with the land, and were recorded with Muskegon County on June 6, 2002. Restrictive Covenants require the owner to: - restrict use of the groundwater including prohibition of wells, which shall not be installed or used by the Owner for any purpose on the Property, unless approved by MDEQ. - ensure any subsurface activity employs safety precautions to prevent unacceptable exposure to hazardous substances in or emanating from groundwater.
Ott/Story/Cordova Site property boundary. **Contaminants in solids and/or groundwater entering on-site structures.** **Ott/Story/Cordova Site property; Indoor Air Pathway (cont'd.)**	- Prevent unacceptable exposure from the indoor air pathway.	Restrictive Covenants require the owner to: - engineer, construct, and maintain any new structures to prevent volatile emissions from hazardous substances in solid and/or groundwater from entering the structures. All buildings constructed on the Property after the date of filing of the restrictive covenants shall be constructed as slab on grade and shall not allow for habitable spaces below grade, unless approved by the MDEQ. - monitor and/or manage indoor air, groundwater, and/or the soils underlying buildings to assure compliance with applicable state and federal laws. U.S. EPA and MDEQ monitor the Site to guarantee any new structures on-site are engineered, constructed, and maintained such that no unacceptable emissions from hazardous substances in solid and/or groundwater enter on-site structures.

Table 8 - Institutional Controls Summary Table
Ott/Story/Cordova; Muskegon, Michigan

Media, Engineered Controls and Areas that do not support UU/UE* for Current Conditions	IC Objective	IC Instrument Implemented
Ott/Story/Cordova Site. Groundwater Not On Site Property. **Contaminated groundwater at potentially affected properties located between the Site property and Little Bear Creek southeast.** Groundwater extraction well system and treatment plant. Residences located between the Ott/Story/Cordova Site property and Little Bear Creek and its unnamed tributary to the southeast are connected to a safe public drinking water supply. Approximately 50-150 residences potentially affected.	- Prohibit use of untreated off-site groundwater that may contain contaminants at unacceptable levels. - Regulate well installation within a certain radius of the Site.	Section 7.0 of Chapter III of the Sanitary Regulations of Muskegon County is enforced by the Board of Health of Muskegon County under the authority of Act 368 of the Public Acts of 1978, as amended. These regulations provide for penalties for their violation and require that no person shall begin construction of a new potable water supply, or make significant change to an existing water supply, without first obtaining a water supply construction permit from the Muskegon County Health Department. The Sanitary Regulations of Muskegon County are attached to this report as Appendix D. An IC implementation and monitoring plan will be developed within six months to investigate: the long term protectiveness of this regulation, the possible need for restrictive covenants on potentially affected properties, and the long term maintenance requirements for Site ICs. U.S. EPA and MDEQ currently monitor off-site groundwater to observe the decrease in contaminant levels and to ensure appropriate water treatment is being implemented where needed.

* Unlimited Use / Unlimited Exposure

Current Compliance: Based on the Site inspection and interviews with on-site personnel, U.S. EPA and MDEQ are not aware of Site or media uses which are inconsistent with the stated objectives of the ICs. The remedy appears to be functioning as intended by remedy decision documents.

Long Term Stewardship: Long term protectiveness at the Site requires compliance with use restrictions to assure the remedy continues to function as intended. To assure proper maintenance and monitoring of effective ICs, long term stewardship procedures will be reviewed and a plan developed. The plan would include regular inspection of ICs at the Site and annual certification to U.S. EPA that ICs are in place and effective. Additionally, use of a communications plan and use of one-call system may be explored for long term stewardship.

IV.D REMEDY OPERATIONS AND MAINTENANCE

IV.D.1 Operation and Maintenance (O&M) - Operable Units #1 and #2

A contract was awarded in August 1999 and renewed in 2004 for LTRA and O&M of the GWTF and extraction well systems, which is the ongoing portion of the Site remedial action. The USACE continues the administration of this contract and oversight of LTRA and O&M activity. In addition to operating the extraction and treatment processes, LTRA and O&M tasks include: procurement of utilities such as gas, water, communications, and electricity, extraction well cleaning and preventive maintenance, possible re-development of wells as needed, continued groundwater sampling and analysis, general repair, maintenance, and minor improvements to the system(s) and GWTF buildings and grounds, repair and minor upgrade of: groundwater collection piping and valving, emission control equipment, residuals handling equipment, monitoring wells, and extraction well vaults and associated equipment. Based on the August 9, 2000 O&F declaration for the GWTF, MDEQ is scheduled to take over 100 percent of LTRA and O&M activity for the GWTF and extraction well systems by 2010.

IV.D.2 Operation and Maintenance (O&M) - Operable Unit #3

MDEQ is responsible for overseeing O&M of O.U. #3 areas and may sample and analyze surface water, sediment, and plant area soil, as needed. MDEQ is responsible for coordination of Site security with the current Site property owner and is the authority for determining appropriate use of the Site property. As noted above and as required by the scope of work for the O.U. #3 remedy, the State of Michigan is responsible for oversight of O.U. #3 O&M, which will mainly be implemented by Muskegon County or the eventual owner or lessee of the Site property.

REMEDY COSTS

Total expenditure to date for this project for all OUs is approximately $64,171,000 with a potential for the total project net present worth to reach a range of $85 to $100 million. Actual remedy costs are higher than cost estimates shown in the Records of Decision.

IV.D.3 Costs - Operable Units #1 and #2

The Record of Decision for O.U. #1 provided a general cost estimate for the scope of work for both O.U. #1 and O.U. #2, revised in the O.U. #2 ROD as follows: $6,000,000 capital cost; $1,400,000 annual O&M cost; $20,000,000 present worth of annual O&M cost; $26,000,000 project net present worth. Known O.U. #1 / O.U. #2 costs to date are summarized in Table 8. Total capital costs for the O.U. #1 and O.U. #2 remedy (including Long Term Response Action costs) are approximately $56,871,000.

The current approximate annual O&M cost for the O.U. #1 / O.U. #2 groundwater remedy is $2,000,000, which has decreased and will continue to decrease with ongoing optimization efforts. For the purposes of this five-year review, it is estimated that a reduction in annual O&M cost should occur every 5 years. An approximation of the present value of O&M cost is shown in Table 11. The estimated net present value until the Year 2025 is approximately $25,976,000, using a 3 percent discount rate.

The net present worth of the entire O.U. #1 / O.U. #2 remedy (capital plus O&M costs) totals approximately $82,847,000. For the purposes of this five-year review, a 30 year total project time period is presumed even though it is possible that the Site remedy may need to operate longer. For operation greater than 30 years, the O.U. #1 / O.U. #2 net present worth increases to a value somewhere between $90,000,000 and $100,000,000.

Costs do not include U.S. EPA, U.S. Department of Justice, or State of Michigan payroll, travel, contractor, and indirect costs. However, the cost for USACE administration of U.S. Government contracts is included in this report because of USACE's day-to-day management of remedy construction, start-up, and operation.

IV.D.4 Costs - Operable Unit #3

The Record of Decision for O.U. #3 provided a general cost estimate for excavation and LTTD treatment as follows: $6,654,254 capital cost; $10,000 annual O&M cost; $154,000 present worth of annual O&M cost; $6,808,254 project net present worth.

As noted in the last Five Year Review Report, cost for O.U.#3 demolition and soil removal work was approximately $2,800,000 including sampling and analysis and oversight contractor costs. The scope of O.U. #3 O&M has been reduced since the last five-year review because O.U. #3 excavation work has been completed and ownership of the Site property has been transferred. Consequently, nominal O&M tasks will be undertaken by Muskegon County or the eventual owner or lessee of the Site property. Potential cost for possible O&M tasks for O.U. #3 was estimated in 2002 at approximately $100,000 per year. Because the completed O.U. #3 remedy work replaced contaminated soils with clean fill, there is no need for exhaustive Site security. Likewise the State of Michigan has determined since the last five-year review that

sampling of Little Bear Creek and its unnamed tributary is infrequently needed. A revised cost estimate for annual O.U. #3 O&M tasks is $13,820, as shown in Table 10. Table 11 shows the present worth value of this annual cost to the Year 2025 is approximately $205,600. For the remaining 20 years of remedy operation at a three percent discount rate, the O.U. #3 project net present worth is approximately $3,006,000.

As noted in the 2002 Five Year Review Report, U.S. EPA previously expended approximately $4,500,000 for discontinued O.U. #3 LTTD work, including design cost. This results in a net project present worth of O.U. #3 to approximately $7,506,000. This does not include U.S. EPA, U.S. Department of Justice, or State of Michigan payroll, travel, contractor, and indirect cost.

V. PROGRESS SINCE LAST FIVE YEAR REVIEW

On August 13, 1997, a five-year review was completed by U.S. EPA Region 5. Because construction and start-up of revisions to the GWTF were still under way, and because the final revisions to the design and scope of O.U. #3 remedy work had not been finalized, the 1997 report consisted of a Type 1a review.

On September 19, 2002, a second five-year review was completed by U.S. EPA. That five-year review noted the O&F status of the GWTF, completion of O.U. #3 work, continued reduction in contamination levels, commencement of the LTRA phase for groundwater, routine O&M of the constructed remedies, and optimization of the O.U. #2 remedy. The second five-year review certified that:

> "The O.U. #1 / O.U. #2 remedy is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals, through pump and treat technology ... In the interim, groundwater exposure pathways that could result in unacceptable risks are being controlled with groundwater containment through extraction, and the removal of contaminated soil. ... All threats at the Site have been addressed through: removal of contaminated soil, continued capture and extraction of contaminated groundwater before reaching Little Bear Creek and its unnamed tributary, and treatment of that contaminated groundwater in the GWTF."

Table 12 summarizes the issues identified in the 2002 second five-year review.

TABLE 12 - ISSUES IDENTIFIED IN 2002 SECOND FIVE YEAR REVIEW

Issues from Previous Review	Recommendations/ Follow-up Actions	Responsible Organization	Milestone Date	Action Taken (Y/N) and Outcome	Date of Action
Transfer of Site Property	Transfer Site Property	Site Property Owner (Cordova Chemical)	12/30/2002	Y Site Property Transferred	9/26/02 and 2/25/03
Deed Restriction	Implement Deed Restriction	Site Property Owner (Cordova Chemical)	12/30/2002	Deed Restrictions Implemented	6/6/02
Detailed Assessment of O.U. #1 / O.U. #2 Remedy (inc. more definitive time estimate to reach cleanup stds)	Complete Detailed Assessment of O.U. #1 / O.U. #2 Remedy	U.S. EPA / BV	3/30/2003	N Not Completed	N/A
ROD Amendment or ESD	Issue ROD Amendment or ESD	U.S. EPA	12/30/2003	N Potential Future Action	N/A
Five Year Review / Remedy Assessment	Perform Five Year Review / Remedy Assessment	U.S. EPA	9/30/2007	Y In Process	Estimated: 9/19/07
Long Term Response Action	Continue Long Term Response Action	U.S. EPA / MDEQ	9/30/2010	Y In Process	Ongoing, Anticipated Completion in 9/2010
Five Year Review	Perform Five Year Review	U.S. EPA / MDEQ	9/30/2012	N Future Action	N/A
Five Year Review	Perform Five Year Review	U.S. EPA / MDEQ	9/30/2017	N Future Action	N/A
Five Year Review	Perform Five Year Review	U.S. EPA / MDEQ	9/30/2022	N Future Action	N/A
GWTF Operations	Continue GWTF Operations	U.S. EPA / MDEQ	9/30/2030	Y In Process	Ongoing, Anticipated Completion 9/2030
O&M for O.U. #3	Perform O&M for O.U. #3	MDEQ	6/30/2032	N Future Action	N/A
Site Operation and Maintenance	Continue Site Operation and Maintenance	MDEQ	9/30/2030	Y In Process	Ongoing

As noted in Section IV.C, ICs have been implemented at the source area(s). The Institutional Controls portion of the O.U. #1, O.U. #2, and O.U. #3 remedies will be completed once all requirements of the forthcoming IC Plan are successfully implemented. The detailed assessment of the O.U. #1 / O.U. #2 Remedy including the calculation of a more definitive time estimate to reach cleanup standards has not been completed because of the previously unknown status of transfer of the Site property to the County, and the final disposition of the County's intentions for property re-development. Consequently, no ROD Amendment or ESD could be developed without this detailed assessment.

At the time of the last five-year review in 2002, Muskegon County was considering applying for external resources to re-develop the Site property. Funding in the form of an approximately $2.6 million U.S. Department of Labor grant was not obtained by the County until 2006. In addition, in 2005-2006, using separate local funding means, as a separate civil works project, the County extended municipal water and sewer service northward from Whitehall Road to properties near the Site. In 2007, the County was finally able to begin some general infrastructure work (such as tree clearing and grubbing) on the Site property, and intends to improve access roads to the Site during the remainder of calendar year 2007.

Operation of the O.U. #1 / O.U. #2 groundwater remedy has continued successfully since 2002, with additional groundwater contamination removed as summarized in Tables 2 and 7.

VI. FIVE YEAR REVIEW PROCESS

VI.A. Administrative Components

The Ott/Story/Cordova five-year review was prepared by John V. Fagiolo, Remedial Project Manager with the U.S. EPA Region 5 Superfund Division. Deborah Larsen, Senior Project Manager for the Michigan Department of Environmental Quality assisted in the review. The five-year review consisted of a Site inspection and review of relevant documents. In addition, technical support staff at U.S. EPA Region 5 provided an analysis of Site groundwater data collected over the past 19 years to determine fate and transport of Site contaminants, and to determine the capture effectiveness of the groundwater extraction network.

As a continuation of the Site work identified in the 2002 five-year review, MDEQ and USACE are active participants in the operation of this remedy, as are the contractors Fishbeck, Thompson, Carr, and Huber (FTCH) and Black and Veatch (BV). FTCH is doing the LTRA / O&M work and BV continues to provide occasional limited Remedial Action support through supplemental monitoring, computer modeling, and general remedy evaluation work on an "'as-needed" basis. Representatives of all these

organizations except BV were involved in the Site visit(s) and were available during the drafting of this Five Year Review Report.

Through monthly update meetings, notifications of U.S. EPA's five-year review process have been provided to USACE, MDEQ, FTCH and BV. Because there are no PRPs any longer for this Site, there is no requirement for PRP notification of this five-year review.

On August 1, 2007, after the July 2007 monthly progress meeting, a detailed Site walk-through and inspection was completed by U.S. EPA and MDEQ representatives, assisted by FTCH and USACE. This five-year review is based on the Site inspection, quarterly monitoring reports, monthly operation reports, historical and current data, and a review of ARARs. The completed report will be made available in the Site information repository for public view.

VI.B. Community Notification and History of Involvement

The area surrounding the Site is semi-rural, with approximately 300 to 500 residents in a one-mile radius of the Site. Residences in the areas affected by contaminated groundwater use potable water supplied by pipeline from the local public water system. There has not been active interest in the Site from the community since the time of remedy decisions, design, construction, and start up approximately 10 years ago. Therefore, no community interviews were conducted for this five-year review. However, a notice was provided on August 3, 2007, regarding the development and availability of this report to the general public in a newspaper of local interest, the Muskegon Chronicle. A copy of this notice is provided as Appendix B. There were no comments received as a result of this notice. U.S. EPA Region 5 will provide further community involvement events if additional community interest results from this Five Year Review Report.

This Five Year Review Report will be placed with all other Site related documents as part of the Administrative Record File, available for public inspection at the following locations:

Walker Branch Library	Dalton Township Hall
1522 Ruddiman Drive	1616 East Riley Thompson Road
Muskegon, Michigan	Dalton, Michigan

The Administrative Record may also be reviewed at:

U.S. EPA Region 5
77 West Jackson Boulevard
Chicago, Illinois

VI.C. Document Review

The documents that were reviewed for this five-year review were quarterly monitoring reports, monthly operation reports, historical and current data, computer groundwater models for the Site, and supplemental evaluations of all data. In addition, ARARs were reviewed to identify any ARARs that may have been revised since the Records of Decision (as amended). Site documents reviewed in preparation of this Five Year Review Report are listed in Appendix A.

VI.D. Data Review

Since the initiation of the Site's remedial actions, BV and FTCH have provided quarterly monitoring of wells associated with the Ott/Story/Cordova project. Tables 2 and 7 summarize the results of this monitoring and show a decrease in the contaminant levels in groundwater. In the August 2003, O.U. #3 Remedial Action Closeout Report, it was certified that O.U. #3 areas have been excavated to depths where contaminant levels are within acceptable levels for future industrial land use.

Review of Site data confirmed that the O.U. #1/ O.U. #2 groundwater extraction system is adequately intercepting contaminated groundwater before reaching Little Bear Creek and its unnamed tributary. Since the system's start-up in 1996, the remedy has removed approximately 9,000 pounds of organic contaminants and has reduced contaminant concentrations by several orders of magnitude in some cases. With operation of the extraction system, the known lateral extent of the contaminant plume remains stable.

The Advanced Analysis and Decision Support Section of U.S. EPA Region 5's Superfund Division performed a computer modeling analysis of quarterly monitoring and system operating data. In general the analyses performed indicate that concentrations of the principal contaminants of concern are declining in most wells. Results of analytic capture zone calculations suggest the extraction wells are successfully extracting contaminants and the system as designed is adequately sized to accomplish remedial objectives and capture composite target zones of contamination. Other details from the analysis will help with specific re-balancing of groundwater extraction rates and will help determine if one or more new monitoring wells are needed to confirm that all areas are being remediated in the most effective way.

Although a final report of findings will be available by December 2007, this analysis will be continued and expanded after this five-year review to better define a specific overall project time period to achieve the O.U. #1/ O.U. #2 remedy's groundwater cleanup goals. In addition, this continued analysis will provide a basis for any potential amendments to the long-term goals of the O.U. #1/ O.U. #2 remedy.

VI.E. Site Inspection

A remedy operations meeting with a Site inspection has occurred every month since the GWTF construction started in 1993. U.S. EPA and MDEQ routinely visit and inspect the Site each month. Monthly meeting participants include the U.S. EPA RPM, the MDEQ Project Manager, and a representative from the MDEQ Surface Water Quality Division, USACE, and FTCH. Full-time on-site staff regularly monitors all remedy components and Site security while performing remedy system upkeep and repair. These inspections and meetings on a monthly basis ensure that the remedy constructed at the Ott/Story/Cordova Site is operating as designed and is protective of human health and the environment. A formal inspection by the RPM to certify the completion of excavation of contaminated soil and back-filling in O.U. #3 areas occurred in March 2002 during one of the monthly meetings.

After the July 2007 monthly progress meeting on August 1, 2007, a detailed Site walk-through and inspection was completed by U.S. EPA and MDEQ representatives, assisted by FTCH and USACE. The areas covered during this specific five-year review inspection included:

- a unit-by-unit walk-through of every building and treatment process component of the GWTF;

- a walk-through in and around selected extraction well vaults at off-Site locations near Little Bear Creek and its unnamed tributary;

- visual inspection of Little Bear Creek at the groundwater confluence;

- inspection by vehicle of the emergency generator system(s) located near the extraction wells;

- a walk-through around the oxycharger unit and treated water effluent outfall at the Muskegon River; and

- inspection by vehicle of the completed (but vacant) O.U. #3 areas.

The completed Site Inspection Checklist is included as Appendix C. Issues found during the five-year review inspection are included in Table 13.

VII. TECHNICAL ASSESSMENT

Question A; Operable Unit #1 and #2: Is the remedy functioning as intended by the decision documents? Yes

VII.A.1. Operable Unit #1 and #2

RA Performance, Operable Unit #1 and #2: Table 2 shows that the O.U. #1 / O.U. #2 remedy have been successful in reducing the concentrations of the groundwater contaminants listed. Throughout groundwater known to be affected by contaminants, cleanup goals have not yet been achieved. Except for the potential need for additional ICs at off-site properties, the remedy as constructed is functioning as intended by the Site decision documents because the system is capturing groundwater before reaching the Creek.

Cost of System Operations/O&M, Operable Unit #1 and #2: As discussed in Section IV.D.4, the current annual cost for O&M of the O.U. #1/#2 remedy is approximately $2,000,000. The O.U. #1 and O.U. #2 Records of Decision estimated the annual O&M cost to be in the range of approximately $1,400,000 to 1,500,000 per year.

Opportunities for Optimization, Operable Unit #1 and #2: As noted in the 2002 Five Year Review Report, pump and treat optimization recommendations were made for this Site. Implementing those recommendations, however, would have required additional capital construction funds and certain process technologies installed in the GWTF would have been dismantled. U.S. EPA, MDEQ, USACE, and the on-site operations contractor determined that the recommended changes in GWTF technology would have increased the amount of on-site labor required for cleaning, maintenance, and repair of the recommended replacement technology.

Another optimization recommendation was to negotiate less stringent GWTF discharge permit standards. After discussion of this recommendation with the appropriate MDEQ Surface Water Division personnel, MDEQ is responsible for administration of the National Pollutant Discharge Elimination System (NPDES) program, it was determined that less stringent standards for the treated water effluent were not possible. This decision considered the current condition of the Muskegon River and recent cleanup initiatives that are required for waterways of the Great Lakes.

However, optimization of the GWTF and extraction wells occurs regularly within routine annual O&M, and is required, wherever possible as part of the LTRA/O&M contract. For example, the number of on-site operations staff has been reduced by training other staff in multiple tasks. The amount of Site monitoring has been reduced based on results of previous monitoring events. A Variable Operations Plan was developed and completed and establishes acceptable variations in GWTF operations; the results are referred to and used accordingly.

Pump and treat optimization recommendations were made for this Site as part of U.S. EPA's Remediation System Evaluation process, but were not implemented because of the increased maintenance that would be required and the impracticability of obtaining less stringent discharge permit limits to the Muskegon River.

Early Indicators of Potential Remedy Failure, Operable Unit #1 and #2: No early indicators of potential remedy failure were noted during the review. Maintenance activities have been consistent with expectations, and Site monitoring continues to assess the groundwater plume and extraction.

Implementation of Institutional Controls and Other Measures, Operable Unit #1 and #2: As discussed in Section IV.M, neither the O.U. #1 nor O.U. #2 RODs require institutional controls as part of the required remedy. However, the O.U. #2 ROD includes the statement: "...monitoring and institutional controls will assist in evaluating effectiveness of restoration measures." To prevent exposure to contaminated groundwater that may present a health risk, groundwater use restrictions are necessary for potentially affected off-site properties. Currently, there exists a local ordinance that prevents the installation of new wells in the vicinity of the Ott/Story/Cordova Site without prior approval of the Muskegon County Department of Public Health. Within 6 months of the signing of this Five Year Review Report, U.S. EPA and MDEQ will develop an IC Plan to evaluate the effectiveness of this local ordinance at preventing unacceptable groundwater use, and to investigate and identify options for additional ICs on off-site properties potentially affected by contaminated groundwater. The feasibility of implementing additional ICs for off-site properties will also be evaluated. GWTF access and use is restricted with a security perimeter fence and full-time on-site operations staff. Restrictive covenants for the Site property and surrounding wooded areas are in place and prevent unauthorized use of the land and the groundwater underlying the Site.

Current Use Compatibility with Land and Groundwater Use Restriction, Operable Unit #1 and #2: Any use that interferes with the GWTF or extraction wells would not be protective of human health and the environment. Site inspections ensure that there are no unacceptable uses of the Site property or outside interference with remedy components or operation. Land use on adjacent parcels does not impact the Site remedies. The GWTF and wells must operate until the year 2030 to maintain capture of groundwater before reaching Little Bear Creek and its unnamed tributary. The property is currently zoned for industrial use and is being prepared by Muskegon County to be eventually used for industrial purposes. Trespassing is prevented by the GWTF perimeter fence, locked vaults at extraction wells, and full-time on-site operations staff.

Question A; Operable Unit #3: Is the remedy functioning as intended by the decision documents? Yes

VII.A.2. Operable Unit #3

RA Performance, Operable Unit #3: As previously mentioned, it has been certified that the excavation and back-filling of O.U. #3 areas was successful. Because of the beneficial effects of the O.U. #1 / O.U. #2 groundwater capture, the O.U. #3 ROD, as amended, required only monitoring of Little Bear Creek and its unnamed tributary. State of Michigan Residential Direct Contact Values for soils (cleanup standards) were included in the O.U. #3 ROD and ROD Amendment for comparison purposes only. The O.U. #3 ROD, as amended, did not establish sediment cleanup standards, which must be developed on a site-specific basis. The O.U. #3 ROD allowed the possibility of excavation and treatment of sediments if monitoring data established the need for these additional measures. The data as shown in Tables 4 and 5 suggest that the general quality of the water and sediment of Little Bear Creek and its unnamed tributary has improved. Contaminant concentration in the surface sediment is less than at depth. The remedy as constructed is functioning as intended by the Site decision documents.

Cost of System Operations/O&M, Operable Unit #3: As discussed in Section IV.L, the current annual O&M cost estimate for O.U. #3 is approximately $14,000. Annual cost for O&M estimated in the O.U. #3 ROD Amendment was $100,416 per year. The estimate has been reduced because it has been determined that the O.U. #3 area does not require the extensive annual monitoring that was originally anticipated.

Opportunities for Optimization, Operable Unit #3: O.U. #3 areas have been remediated and do not require extensive annual O&M. Therefore, there are no opportunities for optimization.

Early Indicators of Potential Remedy Failure, Operable Unit #3: No early indicators of potential remedy failure were noted during the review. Maintenance activities have been consistent with expectations, and current O.U. #3 work by Muskegon County is proceeding consistent with the land use restrictions that are in place.

Implementation of Institutional Controls and Other Measures, Operable Unit #3: As noted in Section IV.M, ICs have been implemented for the O.U. #3 area. The O.U. #3 ROD requires: "...imposition of land-usage restrictions as appropriate." Any use that intrudes on O.U. #3 areas that have been excavated and back-filled, or is not compatible with the limited industrial land use category as defined in Section 20120a(1) of Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, would not be protective of human health and the environment.

Current Use Compatibility with Land and Groundwater Use Restriction, Operable Unit #3: As noted in Section IV.M, ICs have been implemented for the O.U. #3 area.

The Site inspection confirmed that the current land use is compliant with land and groundwater use restrictions in place, and the presence of Site personnel helps to ensure that there are no unacceptable uses of the Site property or outside interference with remedy components or operation. Development of this real estate is proceeding in accordance with the land and groundwater use restrictions that are in place. Land use on adjacent parcels does not impact the Site remedies. The property is currently zoned for industrial use and is being prepared by Muskegon County to eventually be used for industrial purposes. Because of the completed remediation work, trespassers would not be subjected to any unacceptable acute exposure. Treatment plant operators are nearby which discourages trespass in the former plant area during regular working hours, thereby reducing the opportunities for improper dumping, vandalism, illegal residency, or even the installation of wells.

Question B; Operable Unit #1 and #2: Are the assumptions used at the time of remedy selection still valid? Yes

VII.B.1. Operable Unit #1 and #2

Changes in Standards and To Be Considered, Operable Unit #1 and #2: Standards outlined in the 1989 O.U. #1 Record of Decision, 1990 O.U. #2 Record of Decision, and 1997 and 2002 Five Year Review Reports are still valid at the Ott/Story/Cordova Site. ICs are not a specific requirement of the O.U. #1 or O.U. #2 RODs, but an IC Plan will be developed for potentially affected properties located between the Ott/Story/Cordova Site property and Little Bear Creek and its unnamed tributary to the southeast.

Changes in Exposure Pathways, Operable Unit #1 and #2: No changes in the Site conditions that affect exposure pathways were identified as part of the five-year review. There are no current or known planned changes in land use for O.U. #1/#2. The Site property on which the GWTF is located will not be affected by O.U. #3 development work. The groundwater monitoring program continues to effectively assess the known Site groundwater plume.

Changes in Risk Assessment Methodologies, Operable Unit #1 and #2: Risk assessment methodologies used at the Ott/Story/Cordova Site since the second five-year review in 2002 have not changed and do not call into question the protectiveness of the remedy

Question B; Operable Unit #3: Are the assumptions used at the time of remedy selection still valid? Yes

VII.B.2. Operable Unit #3

Changes in Standards and To Be Considered, Operable Unit #3: Standards outlined and updated in the 1993 O.U. #3 ROD, 1998 O.U. #3 ROD Amendment, and the 1997 and 2002 Five Year Review Reports are still valid at O.U. #3 of the

Ott/Story/Cordova Site. Site ICs remain effective since their implementation by Cordova in 2002.

Changes in Exposure Pathways, Operable Unit #3: No changes in the Site conditions that affect exposure pathways were identified as part of the five-year review. The O.U. #3 Site property is being prepared by Muskegon County for future land use that is compatible with the limited industrial land use category as defined in Section 20120a(1) of Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. At this point in time, the County has secured resources to upgrade infrastructure components to the Site property and is scheduled to begin clearing and grubbing of vegetation, Site grading, building demolition, and construction of an access road later in 2007. The groundwater monitoring program has been modified to best assess the known Site groundwater plume.

Changes in Risk Assessment Methodologies, Operable Unit #3: Risk assessment methodologies used at the Ott/Story/Cordova Site since the second five-year review in 2002 have not changed, and do not call into question the protectiveness of the remedy.

Question C; Operable Unit #1 and #2: Has any other information come to light that *could call into question the protectiveness* of the remedy? No

VII.C.1. Operable Unit #1 and #2

Since the time of the 1998 O.U. #3 ROD Amendment, there has been no additional information that may question the protectiveness of the remedy for O.U. #1/ O.U. #2 of the Ott/Story/Cordova Site. The original O.U. #1 and O.U. #2 RODs will likely need to be modified based on: a re-calculated risk assessment to incorporate reduced contaminant levels, assessment of current remedy costs, a more definitive estimate for the time period needed to reach cleanup goals, and the anticipated reasonable future land use for the Ott/Story/Cordova property. Revised State of Michigan standards may provide cleanup standards that may be reached in a shorter time period for the most reasonable future land and groundwater use. In addition, revisions to the O.U. #1 and O.U. #2 remedy may also provide better cost effectiveness.

Question C; Operable Unit #3: Has any other information come to light that could call into question the protectiveness of the remedy? No

VII.C.2. Operable Unit #3

Since the time of the 1998 O.U. #3 ROD Amendment, there has been no additional information that may question the protectiveness of the remedy for O.U. #3 of the Ott/Story/Cordova Site. The O.U. #3 remedy was certified complete in March 2002 after

contaminated soil was removed from the Site and excavated areas replaced with clean soil.

Technical Assessment Summary

Within the past 10 years of construction, start-up, and long term response action activity, no issues or information have arose that question the remedy's effectiveness. In this time period, except for the reduction in contaminant concentrations and remediation of the O.U. #3 area, there have not been any changes to the Site since the Records of Decision, as amended. Because U.S. EPA risk assessment procedure and calculation has not changed since the O.U. #1 and O.U. #2 Records of Decision, and because there has been no change in the population of residents near the Site, the exposure assumptions for this Site have not changed.

Current conditions show a reduction in contaminant levels. In order to ensure that U.S. EPA and MDEQ will be operating the most effective remedy, operations and monitoring data to date and Site cleanup goals will be assessed for possible development of a ROD Amendment or Explanation of Significant Difference (ESD) for Operable Units #1 and #2. Operable Unit #1 and O.U. #2 RODs were written without a definitive estimate for the long-term remedy time period. An update to the Site's groundwater computer model that considers the remedy's effectiveness to date will provide a better time estimate. U.S. EPA Region 5 will revise the O.U. #1 / O.U. #2 remedy decision documents as needed to ensure the most optimal remedy.

According to the data reviewed and the Site inspection, the Site remedies, including implemented Site IC Restrictive Covenants, are substantially functioning as intended by the 1989, 1990, 1993, and 1998 RODs and ROD Amendment. Except for completion of the O.U. #3 cleanup work, there have been no changes in the physical conditions at the Site, standards, contaminant toxicity or exposure pathways that would affect the protectiveness of the remedy. There is no additional information that has been identified that would call into question the protectiveness of the remedy.

As previously noted, the current owner of the Site property, Muskegon County, intends to re-develop the Site property consistent with a reasonable future land use that is compatible with the limited industrial land use category as defined in Section 20120a(1) of Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. At this point in time, the County has secured resources to upgrade infrastructure components to the Site property and is scheduled to begin clearing and grubbing of vegetation, Site grading, building demolition, and construction of an access road later in 2007.

Operable Unit #1 and #2: Except for possible additional ICs that may be needed for properties between the Site and the Creek, the remedy as constructed is functioning as intended by the Site decision documents. The exposure assumptions for this Site have not changed. Current conditions show continuing reductions in contaminant levels and

capture of groundwater before reaching the Creek. Since the time of the 1998 O.U. #3 ROD Amendment, there has been no additional information that may question the protectiveness of the O.U. #1/#2 remedy.

Operable Unit #3: The remedy as constructed is functioning as intended by the Site decision documents. As of 2007, the exposure assumptions for this Site have not changed. Since the time of the 1998 O.U. #3 ROD Amendment, there has been no additional information that may question the protectiveness of the remedies for any Ott/Story/Cordova operable unit.

VIII. ISSUES

Issues affecting protectiveness are shown in Table 13.

Table 13- Current Issues that Impact Protectiveness
Ott/Story/Cordova; Muskegon, Michigan

Issue	Currently Affects Protectiveness (Y/N) Y=Yes; N=No	Affects Future Protectiveness (Y/N) Y=Yes; N=No
1. Detailed Assessment of O.U. #1 / O.U. #2 Remedy, including: a more definitive time estimate to reach cleanup standards, confirmation of groundwater contaminant plume boundaries, assessment of a deep well in the former production area that was possibly used to inject contaminated material (to determine a response action), a further "extent of contamination" characterization of the semi-confined aquifer, and a capture zone analysis that includes hydraulic and chemical evaluations.	N	Y
2. Depending upon the outcome of the detailed assessment of the O.U.#1/#2 remedy, a ROD Amendment or ESD may be necessary.	N	Y
3. Long-term stewardship must be assured which includes implementing, maintaining and monitoring effective ICs. This involves evaluating existing ICs at the Site and the current ordinance and exploring whether additional are required for potentially affected properties between the Site property and Little Bear Creek and planning for long-term stewardship.	N	Y

The following issues were identified during the five-year review process and the Ott/Story/Cordova Site inspection, and impact protectiveness of the remedy:

1. At the time of the 2002 five-year review, a recommendation was made for a detailed assessment of the O.U. #1 / O.U. #2 remedy (including a more definitive time estimate to reach cleanup standards) with the intent of possibly modifying the remedy. It was recommended that the remedy requirements be adjusted to better reflect completed remedy work (decreased contamination) as well as cost and cleanup effectiveness. The detailed assessment was not completed because of the unknown status of transfer of the Site property to Muskegon County and the County's final intentions for property re-development. The detailed assessment needs to be completed and will include an assessment of a deep well in the former production area (O.U. #3) that was possibly used to inject contaminated material, a further extent of contamination characterization of the semi-confined aquifer, and a capture zone analysis that includes hydraulic and chemical evaluations. Based on the results of the assessment potential future response actions may need to be considered.

2. No ROD Amendment or ESD could be developed previously without this detailed assessment. Further, Muskegon County could not make any determinations about property re-development until they identified and obtained resources to improve the Site property for sale. It was not until 2005-2006 that the County received a grant from the Department of Labor. Because the O.U. #3 remedy work has been successfully completed by MDEQ, this re-development is not inconsistent with the reasonable future industrial land use established by MDEQ.

3. The groundwater downgradient of the Site is not anticipated to reach cleanup standards for many years. To prevent exposure to contaminated groundwater that may present a health risk, groundwater use restrictions are necessary for potentially affected properties located between the Ott/Story/Cordova Site property and Little Bear Creek and its unnamed tributary to the southeast. Within 6 months of the signing of this Five Year Review Report, U.S. EPA and MDEQ will develop an IC Plan to investigate and identify options for ICs on off-site properties potentially affected by contaminated groundwater. Existing or new ICs must be researched, investigated, and a strategy developed for implementation. If ICs current existed the agencies will confirm that they are sufficient.

The following additional issues were identified during the five-year review process and Site inspection and do not impact the protectiveness of the remedy:

4. Research the possibility of using mats to cover Oxycharger grates to prevent infiltration by leaves and growth of algae.

5. Replace the windsock in the GWTF area.

6. Refresh exterior paint on GWTF process vessels.

7. Research epoxy coating for the concrete floor in the Filter Building at the extraction well cleaning trailer parking area.

8. Check for and replace burned O.U. light bulbs throughout the GWTF.

IX. RECOMMENDATIONS, AND FOLLOW-UP ACTIONS

Table 14 shows recommendations and follow-up actions resulting from this five-year review, as well as an approximate completion schedule.

Table 14- Recommendations, Follow-up Actions, and Approximate Schedule
Ott/Story/Cordova; Muskegon, Michigan

Issue	Recommendations & Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N) Y=Yes; N=No	
					Current	Future
1. Detailed *Assessment of* O.U. #1 / O.U. #2 Remedy.	Complete a Remedial *Strategy Analysis*, including a more definitive time estimate to reach cleanup standards, confirmation of groundwater contaminant plume boundaries, assessment of a deep well in the former production area (to determine a possible response action), an "extent of contamination" characterization of the semi-confined aquifer, and a capture zone analysis.	U.S. EPA	MDEQ	Sept. 2008	N	Y
2. Depending upon the outcome of the detailed assessment of the O.U.#1/#2 remedy, a ROD Amendment or ESD may be necessary.	Develop and approve a ROD Amendment or ESD as appropriate, based on the findings of the Remedial Strategy Analysis.	U.S. EPA	MDEQ	Dec. 2008	N	Y

Issue	Recommendations & Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N) Y=Yes; N=No	
					Current	Future
3. Long-term stewardship must be assured which includes implementing, maintaining and monitoring effective ICs. This involves evaluating existing ICs at the Site, the current ordinance, exploring whether additional ICs are required for potentially affected properties between the Site property and Little Bear Creek, and planning for long-term stewardship.	Prepare an IC Plan to plan for conducting IC evaluation activities including: review of existing ICs on and off the Site, identification of appropriate ICs for affected properties between the Site property and Little Bear Creek, determining whether additional ICs are required and feasible, and assuring effective long-term stewardship procedures documented by a written plan. Work with individual property owners to implement ICs, if needed.	U.S. EPA with consultation from MDEQ	U.S. EPA	March 2008	N	Y

The remedies for all operable units have been constructed and are operating successfully. Normal LTRA and O&M work demonstrates that the Ott/Story/Cordova Site is monitored closely and there is a continued on-site presence of U.S. EPA, MDEQ, and USACE or their contractors. There is a decrease in contaminant concentrations throughout the known contaminant plume and contaminated soils have been removed from the Site. Within daily O&M activities, the pump and treat remedy is continually being optimized based on cleanup and cost efficiencies.

Now that the Site property has been transferred and a re-development determination made by Muskegon County, U.S. EPA must make a determination as to whether a remedy decision document, ROD Amendment or ESD, should be developed and issued. Changes to ARARs, optimization of the constructed remedies, adjustment of remedy requirements and goals to reflect the most optimal cleanup process, better cost effectiveness, and the differential between ROD cost estimates and actual remedy costs must be addressed by this remedy decision document.

Because the O.U. #3 remedy work has been completed successfully by MDEQ, the Site property can be re-developed in accordance with the reasonable future industrial land use established by MDEQ. U.S. EPA and MDEQ will continue to be involved with this property re-development. Eventually an agreement may be developed with the County or ultimate property owner to drastically reduce or eliminate GWTF costs and allow non-potable use of treated GWTF water by the eventual user of the Site property.

X. PROTECTIVENESS STATEMENTS

The Site-wide remedy at the Ott/Story/Cordova Site currently protects human health and the environment in the short term because O.U. #1 / O.U. #2 groundwater exposure pathways that could result in unacceptable risks are being controlled with groundwater containment through extraction, and excavation of contaminated soil in the O.U. #3 area has eliminated contaminated soil exposure pathways. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: 1) attainment of groundwater cleanup goals through pump and treat technology, which is now expected to require no less than 23 more years to achieve; and 2) compliance with effective ICs; compliance will be ensured by reviewing the existing ordinance to assure its effectiveness, determination whether additional ICs are needed and implementation of institutional controls restricting groundwater use to prevent exposure to contaminated groundwater at potentially affected properties located between the Ott/Story/Cordova Site property and Little Bear Creek to the southeast and planning for long-term stewardship in order to ensure ICs are maintained and monitored.

X.A. Operable Unit #1 & #2; Question A - Yes. Question B - Yes; Question C - No

The remedy at Operable Unit #1 / #2 of the Ott/Story/Cordova Site is considered protective in the short-term, because there is no evidence that there is current exposure and groundwater exposure pathways that could result in unacceptable risks are being controlled with groundwater containment through extraction. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: 1) attainment of groundwater cleanup goals through pump and treat technology, which is now expected to require no less than 23 more years to achieve; and 2) an evaluation of the effectiveness of current institutional controls to prevent exposure to contaminated groundwater at potentially affected properties located between the Ott/Story/Cordova Site property and Little Bear Creek to the southeast and, if necessary and feasible, development and implementation of additional institutional controls for these properties.

X.B. Operable Unit #3; Question A - Yes; Question B - Yes; Question C - No

The remedy at Operable Unit #3 of the Ott/Story/Cordova Site is considered protective of human health and the environment provided the O.U. #3 property is restricted to use compatible with the limited industrial land use category as defined in Section 20120a(1) of Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. ICs have been implemented for the O.U. #3 area to limit land and

groundwater use. Long- term protectiveness requires compliance with effective ICs. Compliance will be assured by reviewing ICs for effectiveness along with procedures for maintaining and monitoring ICs.

XI. NEXT REVIEW

U.S. EPA performs statutory reviews on remedies selected that result in hazardous substances, pollutants or contaminants remaining at sites above levels that allow for unlimited use and unrestricted exposure. Since hazardous substances, pollutants or contaminants are contained and will potentially remain above U.S. EPA and State of Michigan regulatory standards in the future, the Ott/Story/Cordova Site will require ongoing five-year reviews.

The next five-year review for the Site will be completed within five years from the signature date of this review.

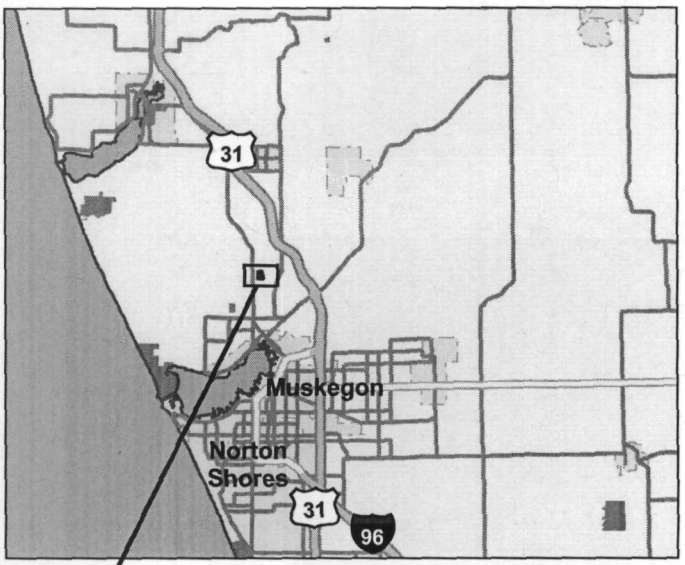
Site Location

Superfund
U.S. Environmental Protection Agency

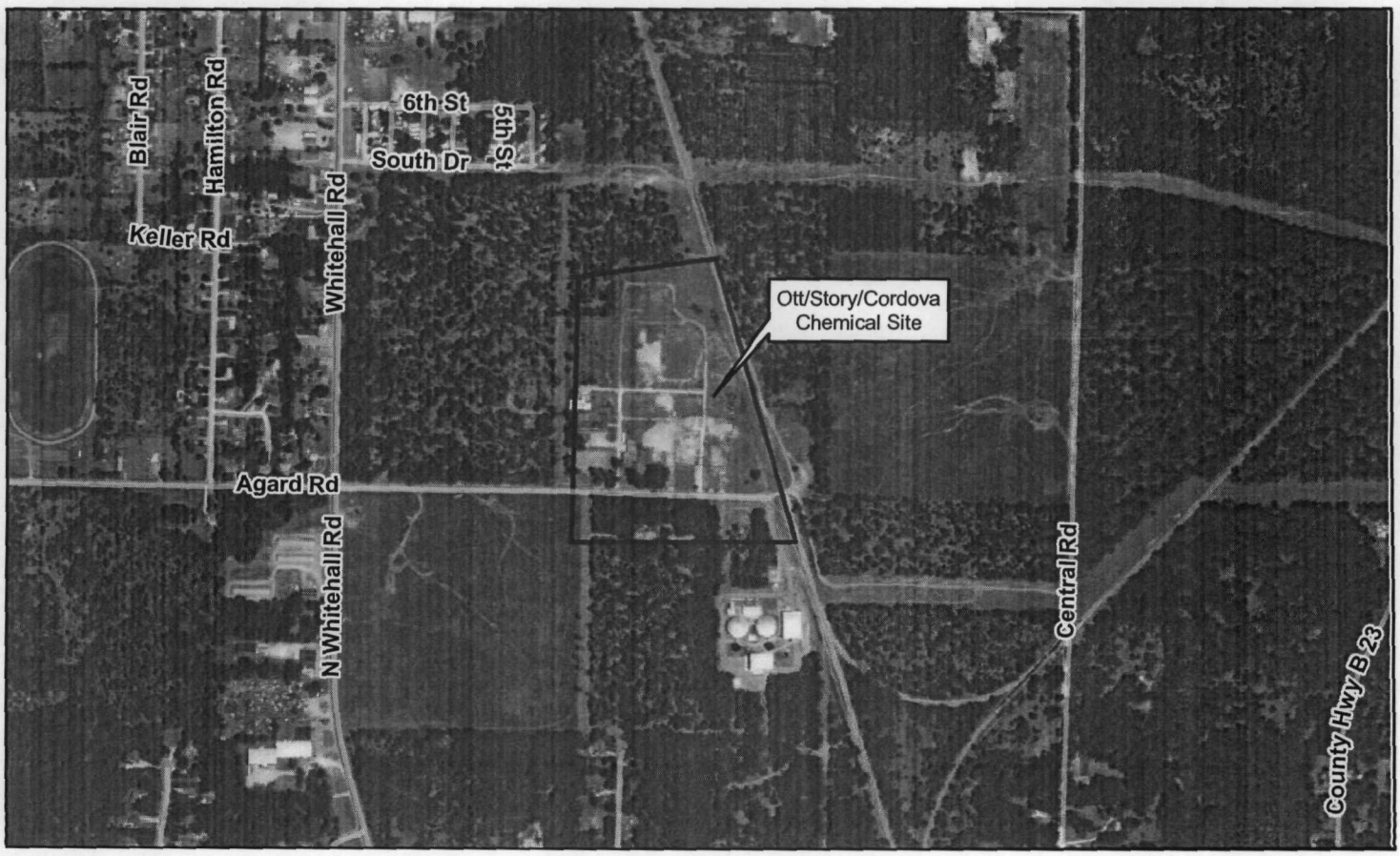
Ott/Story/Cordova Chemical Co.
Muskegon County, MI

MID060174240

State



County



Site

Figure 1

Produced by Sarah Backhouse
U.S. EPA Region 5 on 8/15/07
Image Date: 2005

N

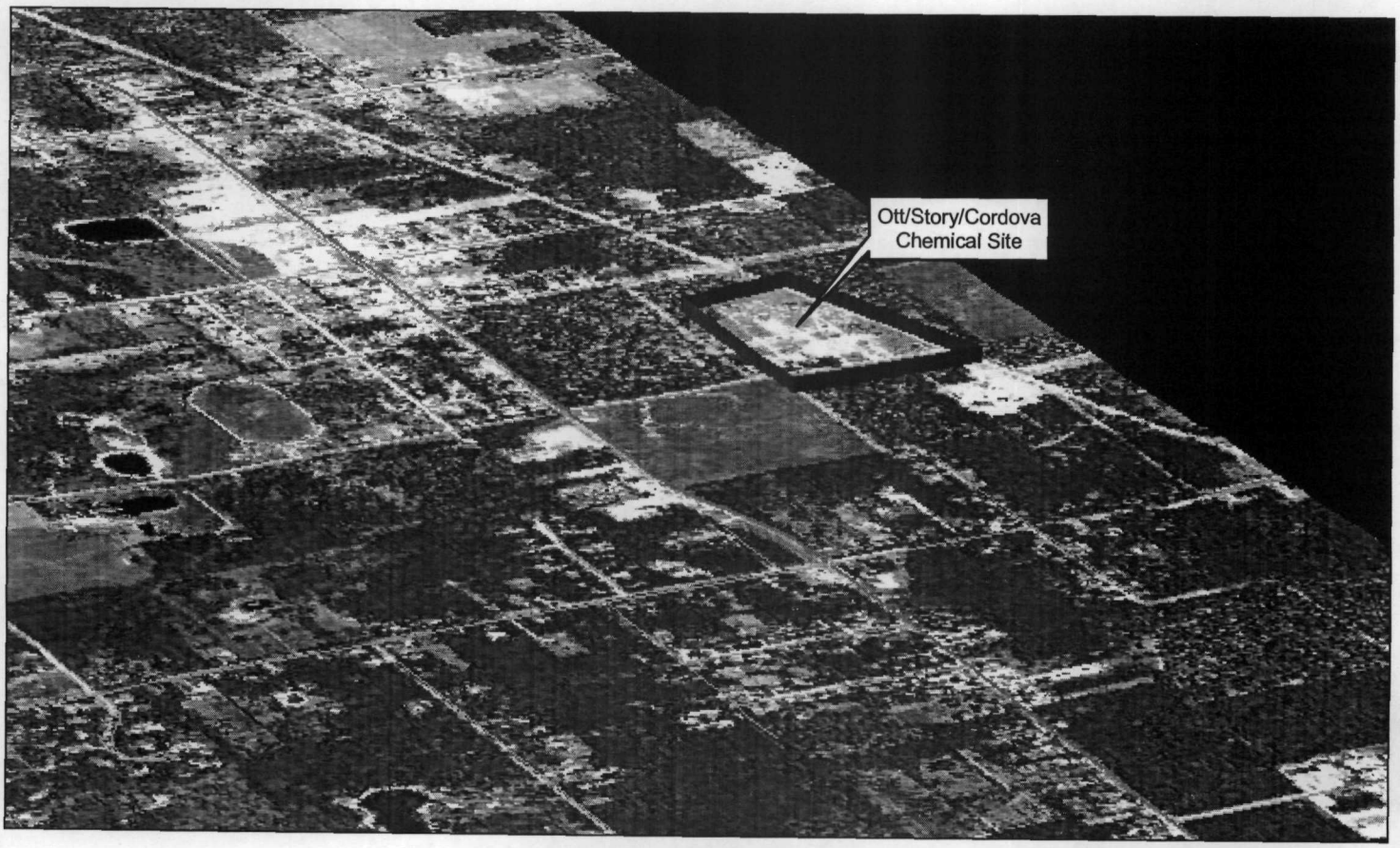
GEOS
Groundwater Evaluation and Optimization System

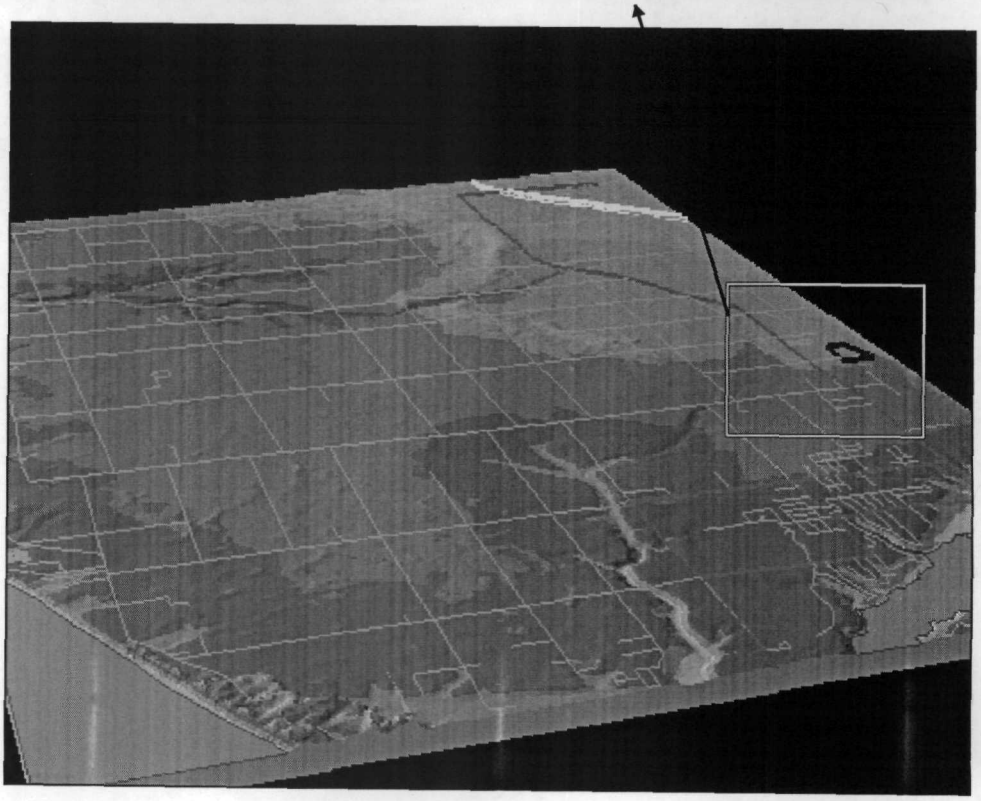
3D Surface Terrain Model

Superfund
U.S. Environmental Protection Agency

Ott/Story/Cordova Chemical Co.
Muskegon County, MI

MID060174240





Elevation Feet

- 725 - 744
- 705 - 725
- 686 - 705
- 666 - 686
- 647 - 666
- 627 - 647
- 608 - 627
- 588 - 608
- 569 - 588

N

GEOS
Groundwater Evaluation and Optimization System

Figure 2

Produced by Sarah Backhouse
U.S. EPA Region 5 on 8/16/07

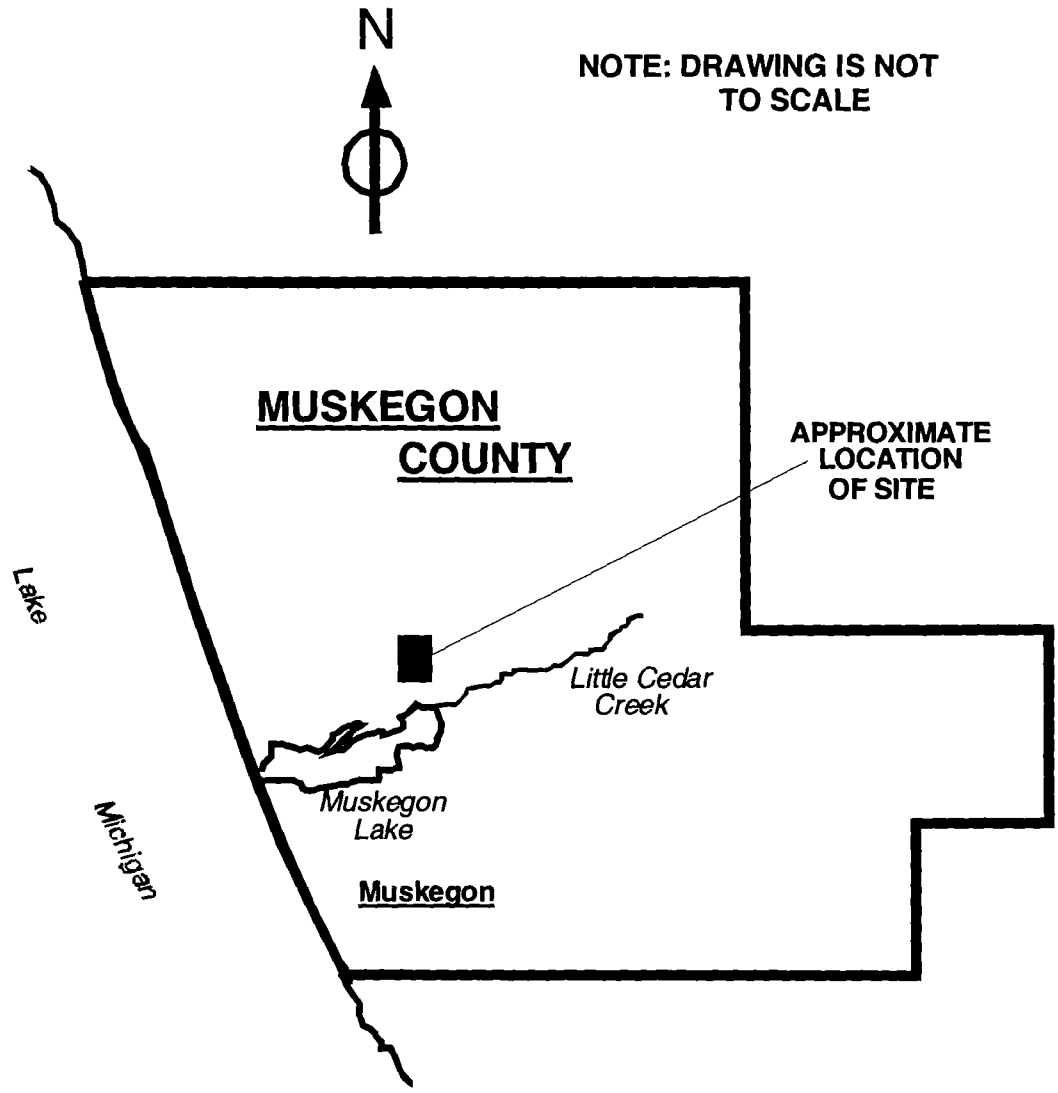


FIGURE 3 - COUNTY LOCATION OF OTT/STORY/CORDOVA SITE

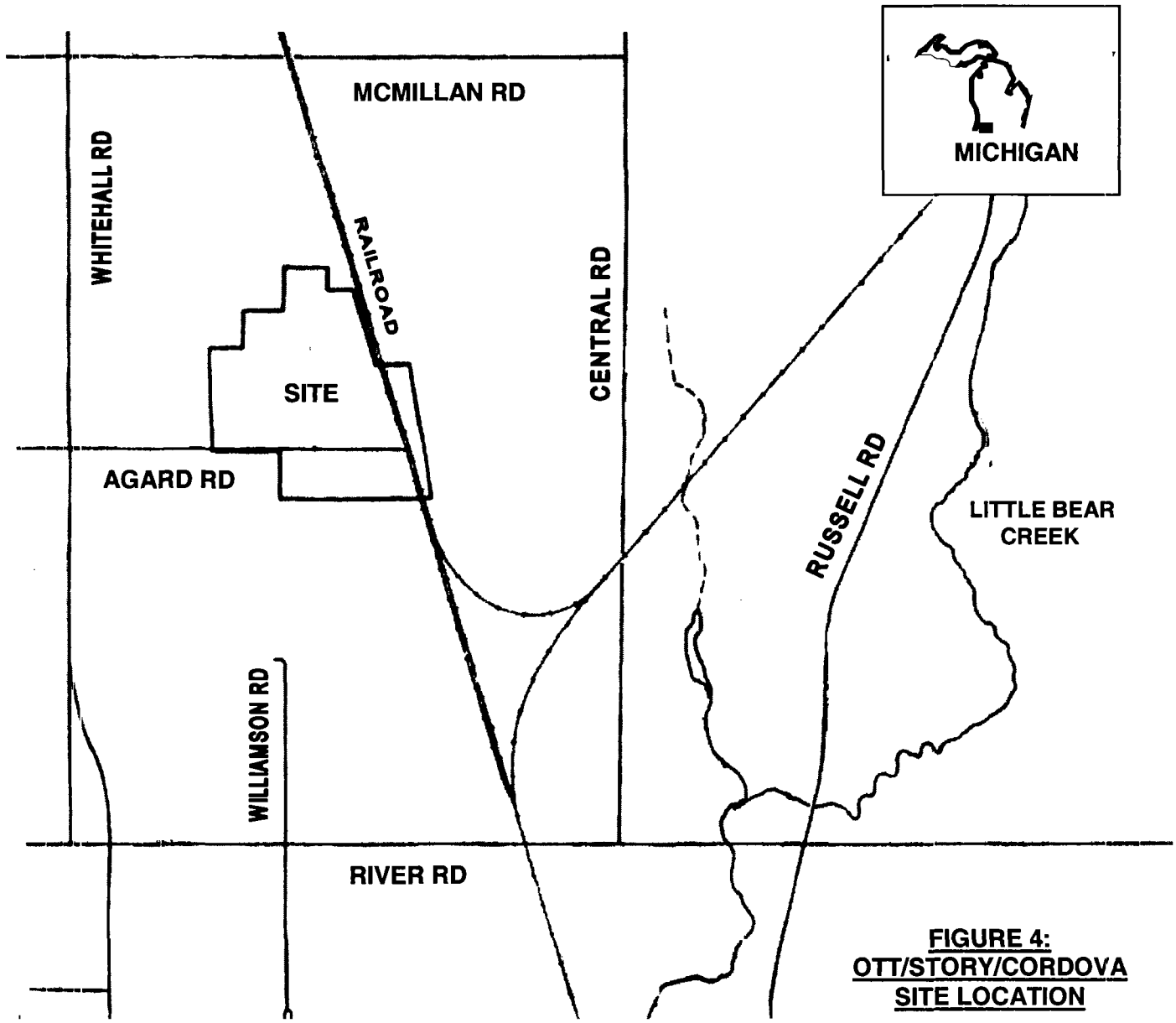


FIGURE 4:
OTT/STORY/CORDOVA SITE LOCATION

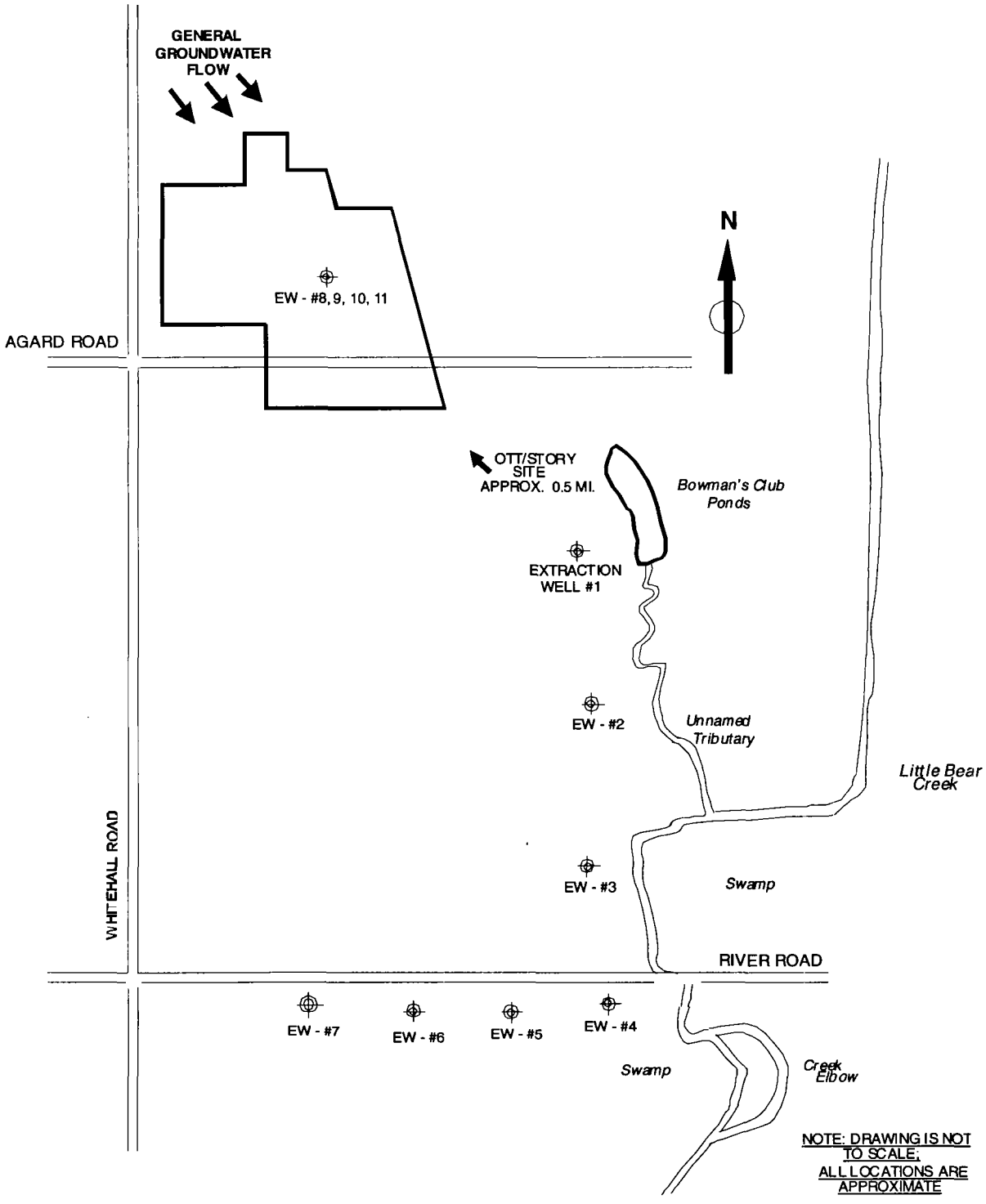


FIGURE 5 - OTT/STORY/CORDOVA SUPERFUND SITE LAYOUT

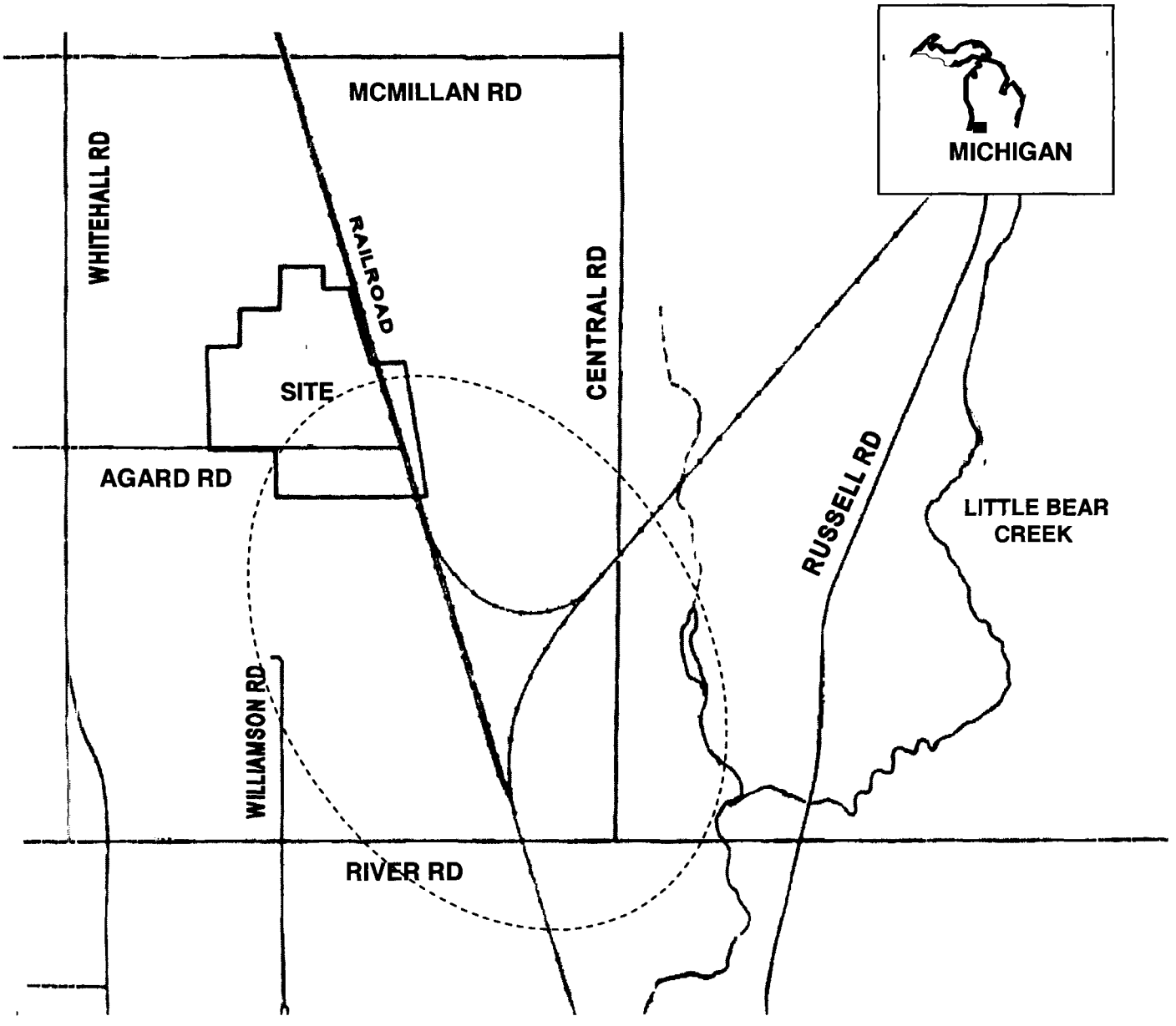


FIGURE 6:
APPROXIMATE AREA THAT DOES NOT SUPPORT UNLIMITED USE / UNRESTRICTED EXPOSURE

TABLE 2 - GROUNDWATER SUMMARY [1]; Ott/Story/Cordova Site

CONTAMINANT	FEDERAL MAX. CONTAMINANT LIMIT (MCL) (ppb)	MI PART 201 RESIDENTIAL GROUNDWATER CLEANUP STD. (ppb)	SAMPLE LOCATION IN CONTAMINATED AREA	CONTAMINANT LEVEL CITED IN ROD[2] (1989) (ppb)	6 MONTHS AFTER GWTF START-UP (Sept. '96) (ppb)	SEPT. 2001 RESULTS (5 yrs of GWTF operation) (ppb)	MARCH 2007 RESULTS (11 yrs of GWTF operation)
Benzene	5	5	W 101 S	3800	190	260	64
1,1 - Dichloroethene	7	7	OW-12	1100	130	39	22
			OW-9	7900	12 (OW-9D)	< 1.0 (OW-9D)	< 1.0 (OW-9D)
			W 101 S	350	25	< 1.0	< 1.0
			W 101 I	970	750	25	200
1,1 - Dichloroethane	N/A	880	OW-12	2400	230	38	30
			OW-9	6300	16 (OW-9D)	< 1.0 (OW-9D)	2.5 (OW-9D)
1,2 - Dichloroethane	5	5	OW-12	110000	440	680	210
			OW-9	21000	980 (OW-9D)	< 1.0 (OW-9D)	< 1.0 (OW-9D)
			W 101 S	2200	58	< 1.0	< 1.0
			W 101 I	110000	720	20	51
			W 101 D	8	5	< 1.0	< 1.0
Tetrachloroethene	5	5	W 101 S	24000	19000	60000	43000
			W 101 D	55	17000	22000	24000

TABLE 2 - GROUNDWATER SUMMARY [1]; Ott/Story/Cordova Site

CONTAMINANT	FEDERAL MAX. CONTAMINANT LIMIT (MCL) (ppb)	MI PART 201 RESIDENTIAL GROUNDWATER CLEANUP STD. (ppb)	SAMPLE LOCATION IN CONTAMINATED AREA	CONTAMINANT LEVEL CITED IN ROD[2] (1989) (ppb)	6 MONTHS AFTER GWTF START-UP (Sept. '96) (ppb)	SEPT. 2001 RESULTS (5 yrs of GWTF operation) (ppb)	MARCH 2007 RESULTS (11 yrs of GWTF operation)
Toluene	1000	790	OW-12	3200	570	220	1.2
			W 101 S	38000	23000	6400	1500
Vinyl Chloride	2	2	OW-12	50000	2100	250	21
			OW-9	130000	74 (OW-9D)	7.8	2.7 (OW-9D)
			W 101 D	9	40	140	49
Benzoic Acid	N/A	32000	OW-12	1300	960 J	< 50	< 50

FOOTNOTES FOR TABLE 2

1 This is only a limited summary. Contaminants shown are provided only as a comparison against the limited list of groundwater contaminants cited in the site Records of Decision. There were additional contaminants identified after the RODs in groundwater and other media for this site. All values shown are in µg/L or parts per billion (ppb).

2 "ROD" is acronym for Record of Decision.

TABLE 3 - CLEANUP STANDARDS AND EXCEEDANCES FOR OTT/STORY/CORDOVA O.U. #3 SOIL EXCAVATION AREAS [1]

CONTAMINANT	O.U. #3 AREA	CLEANUP STANDARD[2] (ppb)	MAXIMUM CONTAMINANT CONC. (ppb)
Carbon Tetrachloride	Area R	100 (20 xDW)	26000
Tetrachloroethene	Area R	100 (20 X DW) 5 (RES) [4]	2300 (year 1988) 100 (year 1995, with leachate >5 ppb*)
1,1,1 - Trichloroethane	Area F	4000 (20 x DW)	17000
bis (2-ethylhexyl) phthalate	Area G,R	330 (TMDL)	1900, 560 J
4-Chloroaniline	Area G	N/A; 1660 ppb[5]	2700
1,2-Dichlorobenzene	Area R	12000 (20 x DW)	13000 J
1,4-Dichlorobenzene	Area R	1500 (20 x DW)	7600 J
Hexachlorobenzene	Area G	20 (20 x DW)	710
	Area R	20 (20 x DW)	980, 7800 J
Aldrin	Area F,G,R	20 (TMDL)	72, 52,29.5
4,4'-DDT	Area F,G,R	200 (20 x DW)	2700, 5900, 1200 J
Dieldrin	Area G	20 (TMDL)	140
Endosulfan I	Area G	96 (20 x DW)	190
Endrin	Area G	40 (20 x DW)	97
Methoxychlor	Areas F,G	800 (20 x DW)	8400, 5300
Arochlor 1248 (PCBs)	Area G,R	330 (TMDL)	5800, 950
TCDD Toxicity Equivalent (Dioxin)	Area F	0.001 (TMDL)	0.77
	Area G	0.001 (TMDL)	0.728

FOOTNOTES FOR TABLE 3

* An asterisk (*) denotes the confirmed exceedance of a current State standard (corresponding to 10^{-5} industrial risk). Excavation of soils is warranted in these areas based on addressing O.U. #3 risks associated with future industrial land use (identified in the 1993 ROD) and in accordance with State of Michigan standards.

1 Cleanup standards as shown in February 1998 Amendment to the Record of Decision for Operable Unit #3.

2 20 x DW - 20 times the Part 201 Industrial drinking water standard. This is the contaminant concentration in soils which, if exceeded, may cause leaching of contaminants into groundwater at levels exceeding acceptable drinking water standards.
TMDL - The Target Method Detection Limit is the lowest value accepted by the State of Michigan that laboratory equipment can measure. If the 20 x DW value is lower than what the laboratory can detect, then the TMDL becomes the cleanup standard.
DCV - Part 201 Industrial Direct Contact Value. This is the contaminant concentration in soils which, if exceeded, presents an unacceptable risk to human health and the environment within a typical industrial scenario. Any exposure to plant area soils would be to an individual working on the Site within a controlled work environment.

3 The 1998 O.U. #3 ROD Amendment established the requirement for excavation of Areas F, G, and R only, to depths shown (through sampling) as having no unacceptable concentrations of contaminants.

4 Residential Groundwater Criteria. In an Industrial scenario, the groundwater standard required by the State of Michigan for the compound Tetrachloroethene is the Residential Drinking Water Standard.

5 Estimated Cleanup Limit calculated by EPA contractor because no standard existed at the time of the 1998 O.U. #3 ROD Amendment. This value may be used during implementation of the Remedial Action to assist in determining adequate excavation depth and is included here for comparison purposes.

DATA QUALIFIER LEGEND

When chemical analysis data is submitted to U.S. EPA, limitations of analytical equipment must be noted with results so an accurate scrutiny can be performed. These limitations are shown as qualifiers, noted as letters next to numerical values. Explanations of these qualifiers are as follows:

J - Signifies a value that was estimated. This means that the compound was detected by the analytical equipment but the value shown may not be able to be reproduced exactly if the analysis were repeated.

B - Signifies a compound that was also detected in a blank. A blank is a 'clean' sample prepared in the laboratory, carried with field samples, transported, and stored. If contamination is found in a blank, there is a possibility that contamination may be from a source other than what was sampled (such as through faulty sampling, storage, transportation, or laboratory procedures).

D - Signifies that the sample shown had to be diluted for the lab equipment to show results that are reproducible.

TABLE 4 - SURFACE WATER SUMMARY [1]; Ott/Story/Cordova Site; Little Bear Creek and Unnamed Tributary

CONTAMINANT	LEVEL CITED IN ROD[2] (ppb)	MAX. LEVEL PRIOR TO 12/96 (ppb)	DATE OF SAMPLING EVENT [1]										
			12/96 (max.) (ppb)	3/97 (max.) (ppb)	9/97 (max.) (ppb)	3/98 (max.) (ppb)	9/98 (max.) (ppb)	3/99 (max.) (ppb)	9/99 (max.) (ppb)	3/00 (max.) (ppb)	9/00 (max.) (ppb)	3/01 (max.) (ppb)	9/01 (max.) (ppb)
Benzene	26	6000	33	17	18	35	8.7	3.3	2.6	ND [3]	ND	ND	ND
1,1 - Dichloroethene	ROD did not cite this contaminant as present in surface water		NOTE: Contaminant not analyzed during quarterly surface water sampling and analysis program.										
1,1 - Dichloroethane	26	26	2	0.69	0.57	1.6	ND	ND	ND	ND	ND	ND	ND
1,2 - Dichloroethane	140	140	ND	0.82	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ROD did not cite this contaminant as present in surface water		40	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	22	6400	24	13	17	20	8	1.1	ND	ND	ND	ND	ND
Vinyl Chloride	52	52	NOTE: Contaminant not analyzed during quarterly surface water sampling and analysis program.										
Benzoic Acid	ROD did not cite this contaminant as present in surface water.		NOTE: Contaminant not analyzed during quarterly surface water sampling and analysis program.										
Tentatively Identified Compounds [4]	ROD did not cite this contaminant as present in surface water.		171	29	123	192	175.1	35	37	ND	ND	31	2.4

FOOTNOTES FOR TABLE 4

1 This is only a limited summary. Contaminants shown are provided only as a comparison against the limited list of groundwater contaminants cited in the site Records of Decision. There are additional contaminants identified within this and other media for this site. Sampling occurred from December 1996 to September 2001. Only the most significant results have been included here. All values shown are in µg/L or parts per billion (ppb).

2 "ROD" is acronym for Record of Decision.

3 "ND" - Contaminant not detected in laboratory analysis.

4 The term "Tentatively Identified Compounds" means that detections of organic chemicals occurred, but distinguishable identifications of a certain compound or isomer could not be made due to the similarity of contaminants within laboratory results.

TABLE 5 - SEDIMENT SUMMARY [1]; Ott/Story/Cordova Site: Little Bear Creek and Unnamed Tributary

CONTAMINANT	LEVEL CITED IN ROD[2] (ppb)	MAXIMUM LEVEL PRIOR TO Dec. 1996 (ppb)	DATE OF SEDIMENT SAMPLING EVENT [3]										
			12/96 (max.) (ppb)	3/97 (max.) (ppb)	9/97 (max.) (ppb)	3/98 (max.) (ppb)	9/98 (max.) (ppb)	3/99 (max.) (ppb)	3/00 (max.) (ppb)	9/00 (max.) (ppb)	3/01 (max.) (ppb)	9/01 (max.) (ppb)	Spring 2004 [6] (max.) (ppb)
Benzene	No sediment contaminants cited in ROD	47500	6280	27000	3500	15000	12000	410	110	470	ND	570	3600
1,1-Dichloroethene		Not analyzed	ND [4]	1200	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane		67	271	2200	ND	170	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane		7.25	ND	320	24	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene		591	NOTE: Contaminant not analyzed during quarterly sediment sampling and analysis program.										
Toluene		99000	4450	20000	4800	23000	20000	5500	2400	390	15	2400	7600
Vinyl Chloride		Not analyzed	ND	1200	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzoic Acid		3640	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Not analyzed
Tentatively Identified Compounds [5]		Not analyzed	106601	246219	100820	122510	41450	55850	12850	31000	8300	26300	ND

FOOTNOTES FOR TABLE 5

1 This is only a limited summary. Contaminants shown are provided only as a comparison against the limited list of groundwater contaminants cited in the site Records of Decision. There are additional contaminants identified within this and other media for this site. Only the most significant results have been included here. All values shown are in µg/L or parts per billion (ppb).

2 "ROD" is acronym for Record of Decision.

3 In the State of Michigan, sediment cleanup criteria are developed on a site specific basis.

4 "ND" - Contaminant not detected in laboratory analysis.

5 "Tentatively Identified Compounds" signify that detections of organic chemicals occurred, but distinguishable identifications of a certain compound or isomer could not be made due to the similarity of contaminants within laboratory results.

6 Preliminary results of sampling and analysis of Little Bear Creek by MDEQ.

TABLE 6 - RISK ASSOCIATED WITH OTT/STORY/CORDOVA PLANT AREA SOILS AND LITTLE BEAR CREEK SYSTEM SEDIMENT AND SURFACE WATER (O.U. #3) [1]

RISKS IDENTIFIED FROM CONTAMINANTS OF CONCERN (EXCEPT DIOXIN) FROM BOTH SOILS AND SEDIMENTS*		
EXPOSED INDIVIDUAL	HAZARD INDEX [2]	LIFETIME CANCER RISK [3]
Current Resident and Trespasser	0.02	2 E -07
Future Worker	0.30	1 E -04
Future Construction Worker	0.46	3 E -06
Future Maintenance Worker	0.40	9 E -05
Future Resident	2.4	3 E -04
CUMULATIVE RISK IDENTIFIED FOR CONTAMINANTS FOUND IN SOILS [1]		
EXPOSED INDIVIDUAL	RISK ATTRIBUTEDTO DIOXIN	TOTAL LIFETIME CANCER RISK [3]
Future Worker	5.15 E -05	1.52 E -04
Future Construction Worker	6.71 E -06	9.71 E -06
Future Maintenance Worker	1.10 E -04	2.0 E -04
Future Resident	2.81 E -04	5.81 E -04

FOOTNOTES FOR TABLE 6

* There was no Dioxin ever detected in Creek sediment.

1 As calculated in the document "Ott/Story/Cordova Operable Unit #3 - Final Risk Assessment Technical Memo" dated December, 1992, prepared by Black and Veatch for U.S. EPA and corrected on December 7, 1997.

2 When the Hazard Index (HI) is greater than 1, there is a potential for health problems such as damage to vital organs, birth defects, and anemia and other blood disorders. U.S. EPA and the State of Michigan may perform Remedial Actions if an HI is 1.0 or above.

3 Using a basis of a 70 year life time. A 1.0 E -06 cancer risk value corresponds to a 1 in 1,000,000 chance that an individual develops cancer as a result of exposure to these concentrations of contaminants over a period of 70 years. Similarly, 1.0 E -05 corresponds to a 1 in 100,000 chance, 1.0 E -04, 1 in 10,000, and so on. U.S. EPA may perform a Remedial Action if cancer risks are greater than 1.0 E -04. The State of Michigan is required to take action at a cancer risk of 1.0 E -05 or greater.

4 "Current Resident and Trespasser" presumes exposure for an individual by ingestion and dermal contact with contaminants in Creek bank sediments and Site soils during trespassing events for the current Site conditions. "Future Worker" assumes exposure to Site surface soils during industrial production activity over 8 hours per day (such as chemical production or factory work). "Future Construction Worker" represents an individual exposed to Site surface and subsurface soils for 8 hours per day for one year during construction activity required for capital projects. "Future Maintenance Worker" signifies an individual who would be performing maintenance such as landscaping, building dismantling, and railroad spur upkeep during an average six months per year. "Future Resident" assumes daily exposure to Site soils for an individual living in a residence located on the Site 350 days per year. All scenarios are in accordance with U.S. EPA risk assessment guidance.

TABLE 7 - GROUNDWATER SUMMARY [1] TO DEMONSTRATE EFFECTIVENESS OF GWTF; Ott/Story/Cordova Site

CONTAMINANT	FEDERAL MAXIMUM CONTAMINANT LIMIT (MCL) (ppb)	MI PART 201 RESIDENTIAL GROUNDWATER CLEANUP STD. (ppb)	CONTAMINANT LEVEL CITED IN ROD[2] (1989) (ppb)	HIGHEST CONCENTRATION OF CONTAMINANT INTO GWTF [3] (3/96 to 6/96) (ppb)	CONTAMINANT GOING INTO GWTF (Feb. 2007) (ppb)	GWTF DISCHARGE PERMIT LIMIT (ppb)	CONTAMINANT DISCHARGED OUT OF GWTF (ppb)
Benzene	5	5	3800	1700	180	5	< 1
1,1 - Dichloroethene	7	7	7900	320	10	5	< 1
1,1 - Dichloroethane	N/A	880	6300	390	36	5	< 1
1,2 - Dichloroethane	5	5	110000	3900	64	5	< 1
Tetrachloroethene	5	5	24000	160	24	5	< 1
Toluene	1000	790	38000	1900	160	5	< 1
Vinyl Chloride	2	2	130000	350	32	5	< 1
Benzoic Acid	N/A	*32000*	*1300*	*220*	< 250	5	< 50

FOOTNOTES FOR TABLE 7

1 This is only a limited summary. Contaminants shown are provided only as a comparison against the limited list of groundwater contaminants cited in the site Records of Decision. There were additional contaminants identified after the RODs in groundwater and other media for this site. All values shown are in µg/L or parts per billion (ppb).

2 "ROD" is acronym for Record of Decision.

3 GWTF started up in Feburary 1996. The period from March to June 1996 represents the time when the GWTF had to treat the highest levels of contaminants to date.

TABLE 10 - O&M COST* ESTIMATE FOR OTT/STORY/CORDOVA O.U. #3 REMEDY

ITEM	UNIT COSTS	TOTAL COST / YEAR
Periodic Inspection of Excavated / Filled Areas. Monitoring and Maintenance of Institutional Controls [1]	$ 2,400 / event (2 events per year)	$ 4,800
Maintenance of Fence and Signage [2]	$ 1,920 / event (1 event per year)	$ 1,920
Little Bear Creek Monitoring (Surface Water / Sediment Sampling and Analysis) [3]	$ 24,000 (every 5 years)	$ 4,800
Sub-Total		$ 11,520
CONTINGENCY (20%)		$ 2,300
TOTAL		$ 13,820

* O&M tasks will mainly be implemented by Muskegon County or the eventual owner or lessee of the site property, with oversight by the State of Michigan. O.U.#3 areas have been excavated to State of Michigan cleanup standards and restored with clean fill. It is anticipated that O&M tasks will not be necessary beyond 30 years and there should not be extensive site security required for O.U. #3. Groundwater monitoring is generally handed within the scope of operation and maintenance of the O.U. #2 remedy.

1 Estimated by U.S. EPA as: $ 150 /hr per person x 8 hrs x 2 people = $ 2,400
(Including travel and other misc. costs)

2 Estimated by U.S. EPA as: $ 120 / hr per person x 8 hours x 2 people = $ 1,920
(Local fencing crew - 2 people)

3 The 2002 estimate was $20,000 per sampling event. Estimated cost shown above is extrapolated to 2007 value (discount rate = 3 %) with one event occurring every 5 years over a 20 year time span. Original estimate was calculated by U.S. EPA contractor.

TABLE 11 - OTT/STORY/CORDOVA; PRESENT NET WORTH OF ANNUAL O.U. #3 COSTS TO YEAR 2025

Discount Rate i = 3%	YEAR	2007 VALUE NEEDED	F/P Factor	FUNDING REQUIRED IN 2007 TO ACHIEVE FUTURE VALUE
	2007	$13,820	1.0000	$ 13,820
	2008	$13,820	1.0300	$ 14,235
	2009	$13,820	1.0609	$ 14,662
	2010	$13,820	1.0927	$ 15,101
	2011	$13,820	1.1255	$ 15,554
	2012	$13,820	1.1593	$ 16,022
	2013	$13,820	1.1941	$ 16,503
	2014	$13,820	1.2299	$ 16,997
	2015	$13,820	1.2668	$ 17,507
	2016	$13,820	1.3048	$ 18,032
	2017	$13,820	1.3439	$ 18,573
	2018	$13,820	1.3842	$ 19,130
	2019	$13,820	1.4258	$ 19,705
	2020	$13,820	1.4685	$ 20,295
	2021	$13,820	1.5126	$ 20,904
	2022	$13,820	1.5580	$ 21,532
	2023	$13,820	1.6047	$ 22,177
	2024	$13,820	1.6528	$ 22,842
	2025	$13,820	1.7024	$ 23,527
	Nominal Total =>	$	**Total Net Present Value 2007 to 2025 ***	**$ 347,118**

* Extraction and treatment of contaminated groundwater started in Year 1996.

Appendix A - List of Documents Reviewed

Five Year Review Report
Ott/Story/Cordova Superfund Site
Muskegon, Michigan

Ott/Story/Cordova documents reviewed in preparation of this Five Year Review Report include the following:

1. Record of Decision for Operable Unit #1 at the Ott/Story/Cordova Superfund Site; Muskegon, Michigan, dated September 29, 1989.

2. Record of Decision for Operable Unit #2 at the Ott/Story/Cordova Superfund Site; Muskegon, Michigan, dated September 29, 1990.

3. Record of Decision for Operable Unit #3 at the Ott/Story/Cordova Superfund Site; Muskegon, Michigan, dated September 23, 1993.

4. First Five Year Review (Type Ia) for the Ott/Story/Cordova Superfund Site; Muskegon, Michigan, dated August 13, 1997.

5. Amendment to the Record Of Decision for Operable Unit #3 at the Ott/Story/Cordova Superfund Site; Muskegon, Michigan, dated February 26, 1998.

6. Superfund Preliminary Close Out Report; Ott/Story/Cordova Superfund Site: Muskegon County, Dalton Township, Muskegon, Michigan, dated May 1, 2002.

7. Quarterly Groundwater Monitoring Summary Reports, 21st Qtr. to 27th Qtr.; O.U. 01 & O.U. 02, by Black and Veatch Corp., dated September 2002.

8. Groundwater Monitoring Report, Ott/Story/Cordova Superfund Site, by Fishbeck, Thompson, Carr & Huber, dated September 2002.

9. Five-Year Review Report; Ott/Story/Cordova Superfund Site; Muskegon County, Dalton Township, Muskegon, Michigan, dated September 19, 2002.

10. Variable Operations Report, Ott/Story/Cordova Superfund Site O.U. 1 & O.U. 2, by Black and Veatch Corp., dated December 1, 2002.

11. Close Out Report for Operable Unit #3 at the Ott/Story/Cordova Superfund Site; Muskegon, Michigan, by Black and Veatch Corp., dated August 1, 2003.

12. Action Plan For Groundwater Remedy Optimization - O.U. 2, dated August 3, 2004.

13. Quarterly Groundwater Monitoring Summary Reports, 41st Qtr. to 44th Qtr.; O.U. 01 & O.U. 02, by Black and Veatch Corp., dated December 2006.

14. Monthly Operating Report, Ott/Story/Cordova Superfund Site, by Fishbeck, Thompson, Carr & Huber, dated February 2007.

15. Groundwater Monitoring Report, Ott/Story/Cordova Superfund Site, by Fishbeck, Thompson, Carr & Huber, dated March 2007.

Appendix B

Five Year Review Advertisement

EPA Begins Five Year Review of the Ott/Story/Cordova Superfund Site

Muskegon, Michigan

U.S. Environmental Protection Agency, with assistance from Michigan Department of Environmental Quality, is doing a five-year review of cleanup activities at the Ott/Story/Cordova Superfund Site, Muskegon, Mich. The Superfund law requires a review at least every five years at sites where the cleanup has started and hazardous materials remain managed at the site. This is the third such review for this site.

Located in Muskegon, this 120-acre site is a former specialty organic chemical production facility. The improper disposal of waste resulted in contamination of ground water that flows into nearby Bear Creek and its unnamed tributary. If not captured, contaminated ground water discharges into the creek. The site remedy called for operating ground-water extraction wells, constructing and operating a ground-water treatment system, and removal of contaminated soil within the former plant area.

The wells and treatment facility have been operating since 1996, and excavation and disposal of contaminated soil was completed in 2001. Previous five-year reviews have found the remedy to be protective of human health and the environment, and working as designed.

Site documents can be reviewed at the site information repository at the Walker Memorial Library, 1522 Ruddiman Ave., Muskegon

The public is invited to comment on the current condition of the cleanup. Written and oral comments should be submitted no later than August 24, 2007, and should be directed to:

John Fagiolo
Remedial Project Manager
U.S. EPA, Region 5 (SR-6J)
77 W Jackson Blvd.
Chicago, IL 60604
312-886-0800
fagiolo.john@epa.gov
800-621-8431, Ext. 60800, weekdays 10:30 a.m. to 5:30 p.m.

2848751-01

STATE OF MICHIGAN
County of Muskegon **ss.**

Paul M. Keep being duly sworn deposes and says that he is the Publisher of the MUSKEGON CHRONICLE, a newspaper printed in Muskegon County and circulated within the Counties of Muskegon, Ottawa, Newaygo, Mason, and Oceana; that the annexed notice was duly printed and published in said MUSKEGON CHRONICLE for One (1) day(s); that is to say, on the 3rd day(s) of August 2007, and the _____ day(s) of _____ 200___, and that said publication was continued during said time without any intermission or omission, and that he has a personal knowledge of the facts above set forth.

Paul M. Keep

Subscribed and sworn to before me this 3rd day of August A.D. 2007.

Penny E. Yaeger
Notary Public, Muskegon County, Mich.

Notary Public State of Michigan
Muskegon County
Expires: 12/28/07

_____ times, $_____

Appendix C

Completed Site Inspection Checklist

Site Inspection Checklist

I. SITE INFORMATION

Site name: OTT/STORY/CORDOVA	**Date of inspection: AUGUST 1, 2007**
Location and Region: MUSKEGON COUNTY, DALTON TOWNSHIP, MUSKEGON, MICHIGAN. REGION 5	**EPA ID:** MID 060 174 240
Agency, office, or company leading the five-year review: U.S. EPA REGION 5	**Weather/temperature:** CLEAR, SUNNY, HOT. 90-95 DEGREES F

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☒ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other: **Excavation and off-site disposal of contaminated soil. (completed in 2001).**

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Karl Jaeger (Name) OSC GWTF Operations Manager (Title) August 1, 2007 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. 231-766-9227 (Site Control room)
   Problems, suggestions; ☐ Report attached:
   Contractor: Fishbeck, Thompson, Carr, and Huber, Inc. (FTC&H, Inc., or FTCH)

2. **O&M staff** N/A (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency: Michigan Department of Environmental Quality (MDEQ)
   Contact: Deborah D. Larsen (Name) Senior Project Manager (Title) August 1, 2007 (Date)
   Phone no. 517-373-4825; [MDEQ Specialized Sampling Unit, Superfund Section]

   Agency: MDEQ
   Contact: Charles Graff (Name) Geologist (Title) August 1, 2007 (Date)
   Phone no. 517-335-2596; [Geological Services Support Unit; Superfund Section]

   Agency MDEQ
   Contact: Thomas P. Berdinski (Name) Senior Environmental Quality Analyst (Title) August 1, 2007 (Date)
   Phone no. .616-356-0212; Water Bureau (formerly Surf. Water Quality Div); Grand Rapids District

4. **Other interviews** (optional) ☐ Report attached. : **NONE**

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks: **Excellent maintenance of O&M documentation**

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A
   ☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A

Remarks: **Excellent maintenance of Safety documentation**

3. **O&M and OSHA Training Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: **Excellent maintenance of personnel training and safety records, both on site and at FTCH home office.**

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A *
☒ Effluent discharge	☒ Readily available	☒ Up to date	☐ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A *
☐ Other permits	☐ Readily available	☐ Up to date	☐ N/A

Remarks: *** No air permit required for this Superfund site, but substantive requirements for perimeter air quality (as administered by MDEQ) have been met for all 10 years of operation. *Sludge disposal has been certified as "non-hazardous" for all 10 years of operation.**

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks: :

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A
   Remarks:

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks:

9. **Discharge Compliance Records**

☒ Air * SUBSTANTIVE REQUIREMENTS	☒ Readily available	☒ Up to date	☐ N/A
☒ Water (effluent)	☒ Readily available	☒ Up to date	☐ N/A

Remarks: *** No air permit is required, but sampling of destruction efficiency for the Thermal Oxidation Unit has occurred regularly for all 10 years of operation and certifies that substantive requirements for perimeter air (10 -6 risk) are met.**

10. **Daily Access/Security Logs** ☒ Readily available ☒ Up to date ☐ N/A
    Remarks: **Daily site sign-in sheets are maintained.**

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility

☒ Other: **FTCH is the contractor for U.S. EPA and MDEQ. Contract administration and oversight provided by U.S. Army Corps of Engineers (USACE)**

2. **O&M Cost Records**

☒ Readily available ☒ Up to date
☒ Funding mechanism/agreement in place

Orig. O&M cost estimate: **1990 ROD: $1,400,000 annual cost** ☐ Breakdown attached

OPERABLE UNIT #1/ #2 REMEDY:

Total annual cost by year for review period if available

From **9/2002**	To **9/2003**	**$ 2,000,000**	☐ Breakdown attached
Date	Date	Total cost	
From **9/2003**	To **9/2004**	**$ 2,000,000**	☐ Breakdown attached
Date	Date	Total cost	
From **9/2004**	To **9/2005**	**$ 2,000,000**	☐ Breakdown attached
Date	Date	Total cost	
From **9/2005**	To **9/2006**	**$ 2,000,000**	☐ Breakdown attached
Date	Date	Total cost	
From **9/2006**	To **9/2007**	**$ 2,000,000**	☐ Breakdown attached
Date	Date	Total cost	

OPERABLE UNIT #3 REMEDY:

Orig. O&M cost estimate: **1993 ROD: $10,000 annual cost** ☐ Breakdown attached

Total annual cost by year for review period if available

From: **2002**	To **2007**	**0 ***	☐ Breakdown attached
Date	Date	Total cost	

*** There is Zero O&M Cost for Operable Unit #3 because of uncertainty regarding re-development of property during this time period. No sampling was needed because the property remained uninhabited and unused for this time period.**

☒ **NOTE: A detailed discussion of O&M costs for all three operable units is provided in the text body of the Five Year Review Report.**

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: **NONE.**

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☒ N/A

Remarks: **No unacceptable damage to the site fencing was observed during the inspection.**

B. Other Access Restrictions

1. **Signs and other security measures** ☒ Acceptable ☐ Location shown on site map ☐ N/A
Remarks: : **No unacceptable damage to site signage was observed during the inspection.**

C. Institutional Controls (ICs)

1.a **OPERABLE UNIT #1/ #2**

Implementation and enforcement

Site conditions imply ICs not properly implemented	☒ Yes ☐ No ☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes ☐ No ☒ N/A

Type of monitoring (*e.g.*, self-reporting, drive by): **N/A**
Frequency: **N/A**
Responsible party/agency: **U.S. EPA and MDEQ**
Contact **John V. Fagiolo** (Name) **Remedial Project Manager** (Title) **August 1, 2007** (Date)

Reporting is up-to-date	☐ Yes ☐ No ☒ N/A
Reports are verified by the lead agency	☐ Yes ☐ No ☒ N/A
Specific requirements in deed or decision documents have been met	☐ Yes ☐ No ☒ N/A
Violations have been reported	☐ Yes ☒ No ☐ N/A
	☐ Report attached

Other problems or suggestions:
Neither the O.U. #1 nor O.U. #2 RODs include language that require institutional controls as part of the required remedy. However, in describing the selected remedy, the O.U. #2 ROD includes this statement: "...monitoring and institutional controls will assist in evaluating effectiveness of restoration measures." In addition, the O.U. #3 ROD requires: "...imposition of land-usage restrictions as appropriate." To prevent exposure to contaminated groundwater that may present a health risk, groundwater use restrictions are necessary for potentially affected properties located between the Ott/Story/Cordova site property and Little Bear Creek and its unnamed tributary to the southeast. These groundwater use restrictions have not yet been implemented. Residences in the area are connected to a safe drinking water source (Muskegon County public water system), and there is a local ordinance that requires approval from the Muskegon County Department of Public Health for any new drinking water wells in the area. Existing or new ICs must be researched, investigated, and a strategy developed for implementation (or confirmation if already existing).

1.b **OPERABLE UNIT #3**

Implementation and enforcement

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)

Frequency: **Monthly**

Responsible party/agency **MDEQ and On-Site Operations Contractor FTCH**

Contact **Deborah D. Larsen** (Name) **Senior Project Manager** (Title) **August 1, 2007** (Date)

Phone no. **517-373-4825; [MDEQ Specialized Sampling Unit, Superfund Section]**

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☒ No ☒ N/A

☐ Report attached

Other problems or suggestions: **MDEQ visits the site property monthly. FTCH is present on weekdays during regular business hours and reports any unacceptable land use to the Agencies. The specific requirements in the restrictive covenants in place are met and have been confirmed by the site inspection. There is no evidence of any land use on the site property, improper or otherwise.**

2.a **OPERABLE UNIT #1/ #2**

Adequacy ☐ ICs are adequate ☐ ICs are inadequate ☒ N/A

Remarks: **Neither the O.U. #1 nor O.U. #2 RODs include language that require institutional controls as part of the required remedy. However, to prevent exposure to contaminated groundwater that may present a health risk, groundwater use restrictions are necessary for potentially affected properties located between the Ott/Story/Cordova site property and Little Bear Creek and its unnamed tributary to the southeast. These groundwater use restrictions have not yet been implemented. Residences in the area are connected to a safe drinking water source and there is a local ordinance that requires approval from the Muskegon County Department of Public Health for any new drinking water wells in the area.**

2.a **OPERABLE UNIT #3**

Adequacy ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: **Owner's Declaration of Restrictions on Current & Future Uses. Restrictive Covenants that restrict current and future use are in place, run with the land, and were recorded with Muskegon County on June 6, 2002. MDEQ visits the site property monthly. FTCH is present on weekdays during regular business hours and reports any unacceptable land use to the Agencies. The specific requirements in the restrictive covenants in place are met and have been confirmed by the site inspection. There is no evidence of any land use on the site property, improper or otherwise.**

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: **No vandalism was evident for any Operable Unit.**

2. **Land use changes on site** ☐ Changes in Land Use ☒ No Changes in Land Use ☐ N/A

Remarks: **The site property was transferred by Cordova Chemical to by Muskegon County, who intends to re-develop[the property into an Industrial Park. In 2007, the County was finally able to begin some general infrastructure work (such as tree clearing and grubbing) on the site property, and intends to improve access roads to the site during the remainder of calendar year 2007. U.S. EPA and MDEQ are consulted regularly by the County regarding this work, which is compatible with the limited industrial land use category as defined in Section 20120a(1) of Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended,**

3. **Land use changes off site** ☒ Changes in Land Use ☒ No Changes in Land Use ☐ N/A

Remarks: **Property to the west of the site is being developed for use by a religious institution. Property to the northeast of the site is being developed for residential use. Both properties have never been identified as having contamination at levels that are not protective of human health and the environment. FTCH and USACE monitor current issues in the community and notify U.S. EPA and MDEQ of any activity that may potentially adversely affect the site or human health and the environment.**

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: **No damage to any road on or near the site was noted, for any Operable Unit.**

B. Other Site Conditions

Remarks: **Site conditions are maintained in on-site Operable #1/#2 areas and off-site extraction well areas in an exemplary manner. The Operable Unit #3 (on-site) area has adequate site conditions mainly because it remains unused.**

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface ☐ Applicable ☒ N/A

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks:_____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ **N/A**

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☒ **N/A**

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance
   ☐ N/A
   Remarks_____

2. **Gas Monitoring Probes**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
   Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
   Remarks_____

4. **Leachate Extraction Wells**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
   Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
   Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____ ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____

H. Retaining Walls ☐ Applicable ☒ **N/A**

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ **N/A**

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER / SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps. and Pipelines ☒ **Applicable** ☐ N/A

1. Pumps, Wellhead Plumbing. and Electrical

☒ Good condition ☒ All wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks: **Excellent maintenance of pumps, wellhead plumbing. and electrical equipment.**

2. Extraction System Pipelines. Valves, Valve Boxes, and Other Appurtenances
☒ Good condition ☒ Valves/plumbing properly operating ☐ Need Maintenance ☐ N/A

Remarks: **Excellent maintenance of pipelines. valves, extraction well vaults.**

3. Spare Parts and Equipment
☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: **Organization and condition of spare parts, equipment, and tools on site is excellent.**

B. *Surface Water Collection Structures, Pumps. and Pipelines* ☐ **Applicable** ☒ **N/A**

1. Collection Structures, Pumps, and Electrical
☐ Good condition ☐ Properly Operating ☐ Needs Maintenance ☒ N/A
Remarks: _____

2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances
☐ Good condition ☐ Properly Operating ☐ Needs Maintenance ☒ N/A
Remarks: _____

3. Spare Parts and Equipment
☐ Good condition ☐ Properly Operating ☐ Needs Maintenance ☒ N/A
Remarks: _____

C. Treatment System ☒ **Applicable** ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☒ Air stripping ☒ Carbon adsorbers * **PACT**
☒ Filters: **Sand Filters; Granulated Activated Carbon Filters**
☒ Additives: **Polymer(CHEMCO P-255HV); Phosphoric Acid; Hydrochloric Acid ; Sodium Hydroxide; Ferric Chloride**
☒ Others: **Extraction Well Cleaning: Acetic Acid /Glycolic Sulfamic Acid (Pure); *Polymer (ARCC SPERCE CB-4)***
☒ Good condition ☐ Needs Maintenance
☒ Sampling ports properly marked and functional
☒ *Sampling/maintenance log displayed and up to date:* ***Located in Control Room***
☒ Equipment properly identified
☒ Quantity of groundwater treated: **Design: 800 gal/min; Actual: 700-730 gal/min**
☐ Quantity of surface water treated annually **N/A**

Remarks: *** Powdered Activated Carbon Treatment Units. All treatment plant .**

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs Maintenance

Remarks: **Maintenance of all electrical enclosures and panels is excellent.**

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☒ Good condition ☒ Proper secondary containment ☐ Needs Maintenance

Remarks: **Extraction Well vaults are in excellent condition. Storage tanks have adequate secondary containment (where required) and/or are inside and sheltered.**

4. **Discharge Structure and Appurtenances**
☐ N/A ☒ Good condition ☐ Needs Maintenance

Remarks: **Oxycharger unit and structure is in good condition. Outfall structure (treated water effluent) to Muskegon River is in good condition, including riprap.**

5. **Treatment Building(s)**
☐ N/A ☒ Good condition ☐ Needs repair ☒ Chemicals and equipment properly stored

Remarks: **All treatment plant buildings are in good shape including paint.**
All chemicals are safely stored in vessels of good condition, including adequate secondary containment where required.

6. **Monitoring Wells** (pump and treat remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☒ All required wells located ☐ Need Maintenance ☐ N/A

Remarks: **Not all wells were visited during the site inspection, but FTCH inspects all wells at least quarterly and reports any problems to U.S. EPA and MDEQ at monthly meetings. FTCH reports that all extraction and monitoring wells are in good condition.**

D. Monitoring Data

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:

☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☐ Applicable ☒ N/A

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks_____

X. OTHER REMEDIES ☐ Applicable ☒ N/A

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The O.U. #1/ #2 remedy requires: interception of contaminated groundwater before reaching Little Bear Creek; environmental monitoring; provision for adequate treatment of collected groundwater; reduction of pollutant mass; and restoration of the aquifer to useable conditions. The O.U. #3 remedy goal is: reduction of infiltration through contaminated soils which may add to groundwater contamination; to eliminate the primary human health risks posed by direct contact with contaminated soil by excavating contaminated soils; implementation of deed restrictions in the form of restrictive covenants; and sampling of surface water and sediments as needed.

Implementation of the O.U. #1 / O.U. #2 remedy has decreased concentration of contaminants in groundwater. the remedy has not yet been operating long enough to realize its goals. It is anticipated based on the contaminant reduction to date that the remedy goal can eventually be achieved. In March 2002, U.S. EPA performed a final inspection of O.U. #3 soil areas and certified that excavation of contaminated soil and back-filling work was complete. Capture of contaminated groundwater has resulted in Creek water and sediment contaminant levels that are lower than the levels cited in the site Records of Decision.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Current site activity in the form of O&M and LTRA for the O.U. #1/ #2 remedy has been successful to date, mainly attributable to the daily conscientiousness of USACE and FTCH. There have been no unacceptable violations of the surface water discharge permit. O&M/ LTRA activity on site has been modified regularly to ensure optimization, resulting in reductions to annual costs. Contaminant levels have decreased, suggesting protectiveness in the long term. Current protectiveness is achieved by capturing contaminated groundwater before reaching Little Bear Creek and by the removal of contaminated soils (which was certified complete in 2002).

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

There has been no unexpected changes in the cost or scope of O&M / LTRA. There have been no inordinate amounts of unscheduled repairs. If the current exemplary O&M / LTRA procedures continue, there will be no compromise of the protectiveness of the remedy in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

O&M/ LTRA activity on site is modified regularly through daily improvements and will continue to reduce annual cost. It is anticipated that the monitoring scope(s) for this site will be reduced because of the amounts of site data that has been collected over the past 18 years.

ATTACHMENT 1: INSPECTION TEAM ROSTER

1. Agency: Michigan Department of Environmental Quality (MDEQ)
Contact: Deborah D. Larsen — Senior Project Manager
Name — Title
Phone no. 517-373-4825
MDEQ Specialized Sampling Unit, Superfund Section

2. Agency: MDEQ
Contact: Charles Graff — Geologist
Name — Title
Phone no. 517-335-2596
Geological Services Support Unit; Superfund Section

3. Agency: MDEQ
Contact: Thomas P. Berdinski — Senior Environmental Quality Analyst
Name — Title
Phone no. .616-356-0212
Water Bureau (formerly, Surface Water Quality Division); Grand Rapids District

4. Contractor: Fishbeck, Thompson, Carr, and Huber, Inc. (FTC&H, Inc., or FTCH)
Contact: Karl Jaeger — OSC GWTF Operations Manager
Name — Title
Phone no. 231-766-9227 (Ott/Story/Cordova Site Control Room)

5. Agency: U.S. Army Corps of Engineers
Contact: Brian J. Bouwhuis — Office Engineer
Name — Title
Phone no. 231-842-5510, ext. 25529 [USACE Detroit District; Grand Haven Area Office]

Appendix D

Sanitary Regulations of Muskegon County

SANITARY REGULATIONS

MUSKEGON COUNTY

Enforcing Agency:
Muskegon County Health Department Environmental Health Division
209 E. Apple Ave., Suite C173
Muskegon, MI 49442
(231) 724-6208

Effective April 26, 2005 As Amended
Effective October 14, 1984 As Amended
April 26, 1994 (Chapter III, Board Resolution, HR-94/04-49)
September 14, 1999 (Chapter III, Board Resolution, HR-99/09-61)

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MUSKEGON COUNTY SANITATION REGULATIONS

CHAPTER I
PURPOSE, ADMINISTRATION. AND GENERAL DEFINITIONS

Section A Purpose

The broad objective of these regulations is to provide a means for safeguarding the environment necessary for the health and welfare of the consumer and all residents of Muskegon County.

Section B Authority, Jurisdiction, and Administration

Authority - By virtue of the power vested in the Board of Health of Muskegon County under the authority of Act 368 of the Public Acts of 1978, as amended, there are hereby provided regulations affecting the public health, safety, and welfare relating to sewage disposal and garbage disposal within the County of Muskegon, State of Michigan, and to provide penalties for the violations of such regulations.

Jurisdiction- The Muskegon County Health Department shall have jurisdiction throughout Muskegon County, including all cities, villages and townships, in the administration and enforcement of the regulations, including all amendments hereafter adopted unless otherwise specifically stated.

Nothing herein contained shall be construed to restrict or abrogate the authority of any municipality in Muskegon County to adopt more restrictive ordinances, or to enforce existing ordinances relating to these regulations, control or issuance of licenses, or the renewal or revocation thereof, or to charge and collect a fee therefore, provided that whenever inspection relating to health or sanitation is required, no such municipality shall issue or renew such license without first having obtained a written statement from the Muskegon County Health Department indicating compliance with the requirements of these regulations.

Enforcement - All premises affected by the requirements of these regulations shall be subject to inspection by the health officer, and the health officer may collect such samples for laboratory examination as he deems necessary for the enforcement of these regulations.

Right of Entry and Inspection- No persons shall refuse to permit the health officer to inspect any promises nor shall any person molest or resist the health officer in the discharge of his duty, and the protection of the public health. In the event entry is refused, the department shall be authorized to procure a search warrant pursuant to Sections 2241 through 2246 of the State Health Code.

Fees - All fees collected by the Health Officer shall be receipted for and be deposited with the Treasurer of Muskegon County to the credit of the Muskegon County Health Department.

Penalty - Criminal - Any person who shall fail to comply with any provision herein shall be deemed guilty of a misdemeanor and, on conviction hereof, shall be punished by a fine of not more than One Hundred ($100.00) Dollars or by imprisonment in the County Jail of not more than ninety (90) days or both such fine and imprisonment in the discretion of the Court. Each twenty-four hours that said owner shall knowingly permit said violation of these regulations shall be deemed an additional offense.

Interference with Notices - No person shall remove, mutilate, or conceal any notice or placard posted by the health officer except by permission of the Health Officer.

Validity - If any section, subsection, clause, or phrase of these regulations is, for any reason, adjudged unconstitutional or invalid, it is hereby provided that the remaining portions of these regulations shall not be affected thereby.

Other Laws and Regulations -These regulations are supplemental to the rules and regulations duly enacted by the Michigan Department of Environmental Quality and to laws of the State of Michigan relating to public health which shall supersede all local ordinances heretofore enacted inconsistent therewith and these regulations.

Notification -Notification of the adoption of all regulations promulgated by the Board of Heafth, under authority of Act 368 of the PA of 1978, as amended, and approved by the Board of Commissioners of Muskegon County shall be published in a newspaper circulated in the County within 30 days after such action, indicating where copies of such regulations can be obtained.

Effective Date - These regulations or amendments thereto shall become effective on the 30th day after the date of publication.

Section C General Definitions

Words and Terms

When consistent with the context, words used in the present tense include the future, words used in the singular number include the plural and words in the plural include the singular number. The word 'shall' is always mandatory and not merely directional. Words and terms not defined herein shall be interpreted in the manner of their common usage.

The following words and terms used in these regulations, unless otherwise expressly stated, shall have the following meaning:

"Board of Health" shall mean the Board of Health of Muskegon County comprised of its Health Committee.

"Health Department' shall mean the Muskegon County Health Department

"Health Officer" shall mean the Director or the Acting Director of the Muskegon County Health Department and/or his authorized representative

"Municipality" shall mean any incorporated city, village or township within the County of Muskegon.

"Habitable Building" shall mean any structure where persons reside, are employed, or congregate.

"Premise" shall mean any tract of land containing a habitable building.

"Person" shall mean an individual, or a firm, partnership, company, corporation, trustee, association, or any public or private entity.

"Dwelling" shall mean any house, building, structure, tent, shelter, trailer, or vehicle, or portion hereof, which is occupied in whole or in part as a home residence, living or sleeping place of one or more human beings, either permanently or transiently.

CHAPTER II
SEWAGE DISPOSAL

Scope: These regulations relate to sewage disposal systems and apply to all lots and premises used for residential purposes.

Section A General Definitions

Words and Terms

The following words and terms used in this chapter, unless otherwise expressly stated, shall have the following meaning:

"Sewage" shall mean the liquid wastes from all habitable buildings, and shall include human excreta and wastes from sink, lavatory, bathtub, shower, laundry, and any other water-carried wastes of organic or inorganic nature excluding roof, footing and storm drainage, either singly or in any combination thereof. Clear water waste from water-cooled machinery and brine wastes from water softeners shall also be excluded.

"Block trench absorption system" shall mean an underground enclosure connected to the outlet of a septic tank constructed of concrete block, brick, or precast concrete units laid within open joists so as to allow the septic tank effluent or overflow to be absorbed directly into the surrounding soil. Covers shall be reinforced and easily removable or provided with portholes for cleaning and inspection purposes.

"Sewers hall mean a conduit pipe for carry off sewage.

"Absorption field" shall mean a system for distributing septic tank overflow or effluent below the ground surface by means of a series of branch lines of drain tile laid with open joints or other approved pipe so as to allow the overflow or effluent to be absorbed by the surrounding soil.

"Sewage disposal system" shall mean the method of disposing of sewage by means of a sewer line connected to a septic tank and one or more of the following: block trench, seepage bed, tile field or any other similar device or devices approved by the Health Officer.

"Septic tank" shall mean a watertight tank or receptacle of sufficient size used for the purpose of receiving wastes from flush toilets, sinks, lavatories, bathtubs, showers, laundry drains, basement floor drains, or other similar waste lines, and intended to provide for the separation of substantial portions of the suspended solids in such wastes and for the partial destruction by bacterial action of the solids so separated.

"Flush toilet" shall mean a type of closet or plumbing receptacle containing a portion of water which receives human excreta and so designed as by means of a flush of water to discharge the contents of the receptacle to an outlet connection.

"Other toilet devices" shall mean privies, septic toilets, composting toilets, chemical toilets, and other such devices used for the disposal of human excreta.

"Dosing tank" is a watertight tank or receptacle used for the purpose of retaining the overflow or effluent from a septic tank, pending its automatic discharge to a selected point.

"Automatic siphon" is a mechanical device which will automatically cause a liquid entering a receptacle to be retained until a predetermined high-water level has been attained after which it is automatically released from the receptacle until a second predetermined level has been reached, at which time the flow from such receptacle ceases until the high-water level has again been attained.

"Mean seasonal high water" shall mean the average of the seasonal high groundwater levels over a period of the ten years last past.

"Percolation test" is measuring the rate by which water drops in a presaturated test hole. The rate expresses the soil's ability to transmit water in all directions simultaneously and is usually expressed in inches per hour.

"Public sanitary sewer system" means a sanitary sewer or a combined sanitary and storm sewer used or intended for use by the public for the collection and transportation of sanitary sewage for treatment or disposal and owned or operated by a governmental agency or a private corporation, association, partnership or individual.

"Permit shall mean a document issued by the Muskegon County Health Department authorizing the construction and operation of a sewage disposal system for an individual structure or group of structures according to plans and specifications as approved by the Health Department.

"Fill sand" shall mean clean sand free of clay, silt, black dirt, and vegetation.

"Structure in which sanitary sewage originates" means a building in which toilet, kitchen, laundry, bathing or other facilities which generate water-carried sanitary sewage, are used or are available for use for household, commercial, industrial or other purposes.

"Available sanitary sewer" shall mean a public sanitary sewer system located in a right-of-way, easement, highway, street or public way which crosses, adjoins or abuts upon the property and passing not more than 200 feet at the nearest point from a structure in which sanitary sewage originates.

"Health Officer" means the Public Health Officer of Muskegon County Health Department or any other employee of the Department designated or authorized by the Public Health Officer to perform services or functions pursuant to the provisions of these regulations.

Section B Approved Type Sewage Disposal System on All Premises

Disposal Facilities Required Prior to Occupancy

It shall be unlawful for any person to occupy, or permit to be occupied, any premise which is not equipped with adequate facilities for the disposal in premise which is not equipped with adequate facilities for the disposal in a sanitary manner of human excreta and sewage. Such facilities shall be constructed in accordance with the provisions of these regulations. All privies and other toilet devices shall be constructed and maintained in accordance with the regulations adopted by the State Council of Health, June 6, 1940, as last revised on July 20, 1946, entitled "A Regulation Pertaining to the Construction and Maintenance of Outhouses and to Safeguard the Public Health by Preventing the Spread of Disease and the Existence of Sources of Contamination" in accordance with Act No. 273, Public Acts of 1939.

No Liquid Wastes to Ground Surfaces

Under no condition may the sewage from any existing or hereafter constructed premise, facility, travel trailer, camper, motor travel home or any waterborne craft be deposited upon the surface of the ground, into roadside ditches, water courses, ponds, lakes, or streams or into any closed drain other than a sanitary sewer.

Section C Privies Prohibited Where a Municipal Sewerage System is Provided

No privy shall hereafter be constructed on, or moved to, any premise where the service of a publicly operated sewerage system is available, or if not available at the time of construction, then within 18 months after the same becomes available. Such systems shall be deemed available whenever a public sewer is located in a right-of-way, easement, street, highway or public right-of-way which crosses, adjoins or abuts upon the property and passes not more than 200 feet from a structure in which sanitary sewage originates, provided that the owner and operator of said public sewer will permit such connection. All privies on premises connected to the publicly operated sewerage system shall be abandoned in such a manner as to prevent any nuisance or menace to public health.

Section D Connection Required to a Municipal Sewerage System

All flush toilets, lavatories, bathtubs, showers, and laundry drains hereafter constructed on a premise shall be connected with a publicly operated sewerage system when such system is available. Such systems shall be deemed available whenever a public sewer is located in a right-of-way, easement, street, highway or public right-of-way which crosses, adjoins or abuts upon the property and passes not more than 200 feet at the nearest point from a structure in which sanitary sewage originates, provided that the owner and operator of said public sewer will permit such connection. In the absence of an available public sewerage system, connection shall be made to a sewage disposal system constructed in accordance with the provisions of these regulations. Footing drainage, roof water, and any other waste water not defined as sewage shall not be connected to or discharged into the septic tank system, the absorption field, or into a publicly operated sewage system. When any existing sewage disposal facility, serving any premise where a b=publicly operated sewerage system is available as above set forth, is found in violation or any provision of these regulations, or of any other applicable health law, ordinance, or regulation, the owner shall correct the violation by proper connection to said publicly operated sewerage system. Such connection shall be made within a time limitation, as specified herein. The Health Officer shall send a written notice to the property owner pursuant to the State Health code.

Within a period of 18 months after a public sanitary sewerage system becomes available as above set forth, all premises shall connect to the public sanitary sewer system.

Section E Separate Systems

Unless specifically approved by the Health Officer, each on-site disposal system shall serve only one and two-family dwellings.

Section F Public or Private Drain

Whenever the Health Officer shall determine that improperly treated sewage is flowing or emanating from the outlet of any public or private drain, he shall notify in writing persons owning, leasing, or residing in such premises from which such sewage originates, to connect such sewage flow to publicly operated sewage systems, if available, or in the absence thereof, to comply with the provisions of this Ordinance.

The notice to the owner, lessees, or residents of such properties shall inform said persons of such unlawful discharge of improperly treated sewage into such drain and shall specify the maximum period of time within which such unlawful discharge shall be terminated, which shall not be less than 30 days, except where there is an immediate hazard to public health, safety and welfare by the continued improper drainage.

If, after the expiration of the minimum period of time specified in the notice, such

unlawful discharge continues, the Health Officer may plug or cause to be plugged, the outlet or outlets to the drain through which the sewage is being conveyed. In instances where the sewage disposal system of the premises is incapable of satisfactory operation without such discharge of improperly treated sewage to the public drain, or, where the Health Officer is unable to plug the flow of sewage, the Health Officer shall institute all necessary and proper legal remedies to abate the nuisance and threat to public health, safety and welfare, which shall include restraining orders, temporary and permanent injunctions and summary proceedings to vacate the premises until such time as the sources of pollution have been eliminated.

Section G Type and Location of Private Sewer Lines

Any buried sewer or pipe used to conduct untreated sewage from a dwelling or habitable building shall be constructed of service weight or heavier cast iron soil pipe with leaded and caulked joints tested for water tightness, or PVC Schedule 40 pipe or other acceptable material approved by the Health Officer. No buried sewer line shall be located less than ten (10) feet from a water suction line, well casing, spring structure, or other drinking water source. Where such pipes or sewers are located inside or beneath a habitable building, or within five (5) feet outside the inner face of such building, they shall be constructed of such materials as specified in this section.

Section H Condemnation of Existing Installations

The Health Officer may condemn any existing sewage disposal system where the effluent therefrom is exposed to the surface of the ground or permitted to drain onto the surface of the ground or into any lake, river, storm sewer, or stream, or where the seepage of effluent therefrom may endanger a public or private water supply or where a public nuisance is created by any such system improperly constructed or maintained. An individual sewage disposal system so condemned shall be repaired, rebuilt, or replaced by a system constructed according to the provisions of these regulations within a period of time specified by the Health Officer. This becomes the responsibility of the owner of record for such repairs so ordered.

Section I Permit for Sewage Disposal System

From and after the effective date of these regulations, it shall be unlawful for any person to construct, repair, or extend any sewage disposal system within Muskegon County unless he has a permit issued by the Health Officer. Failure to construct according to specifications herein shall be deemed a violation of these regulations for which the installer of the system may be held liable.

Section J Application and fees for a Sewage Disposal Permit

Permit Required

A permit to construct a sewage disposal system shall be in writing and shall be signed by the applicant.

Information Required on Application

The person making application for a permit (thereinafter called the applicant) shall, on forms to be provided by the Health Officer of the Muskegon County Health Department, provide the following information:

Legal description and/or address of property where sewage disposal system is to be installed.

a. The name and address of the owner and applicant.
b. Date.
c. Proposed use of the lot if other than for a single family residence shall be indicated.
d. The water table level on the date of the application and the elevation of the mean seasonal high groundwater table where the same is within six (6) feet of the finished ground surface.
e. The Health Officer may require soil percolation rates in minutes per inch as determined by the standard percolation test procedures as outlined in the Manual of Septic Tank Practice, U.S. Public Health Service.

Fee to Accompany Application

A fee shall be charged for each permit issued for the installation of a sewage disposal system as defined herein. This fee shall be payable at the time of filing the application for permit by the owner to the Muskegon County Health Department to be deposited with the Muskegon County Treasurer. Such fee shall be established by the Muskegon County Board of Health.

Variances

These regulations provide minimum standards to be used in the design and construction of all subsurface sewage disposal systems. However, special circumstances, limitations, dimensions, or features may exist creating a physical impossibility for compliance. Such circumstances or limitations may justify a variance from a portion of these regulations. Such variances may be granted in writing by the Muskegon County Health Officer if the variance will not create the potential for a public health hazard or nuisance condition, and if the variance will provide suitable treatment of the sewage.

Validity

A sewage disposal permit shall remain valid for a period of two years from date of issuance unless an extension is requested from, and approved by, the Health Officer.

A sewage disposal permit shall not be transferable as to permit holder or property location.

Section K Criteria for Building Site Acceptance

Drainage and Soil Conditions

No permit shall be issued where percolation tests indicate the stabilized percolation rate exceeds 45 minutes per inch.* All percolation tests shall be conducted at the proposed depth of the absorption field. A permit shall not be issued when the building site is subject to ponding or flooding in the areas proposed for the absorption field or where flooding of the area has occurred more than once within the preceding ten (10) years or if the proposed sewage disposal system cannot be built to comply with construction requirements set forth in these regulations. Percolation tests shall be made in the general area to be used for subsurface disposal systems. Health Department personnel shall not be required to run percolation tests. The person making the percolation tests shall furnish a certified statement as to the results of such tests. The person making the test shall be a licensed professional engineer or registered sanitarian in the State of Michigan. If fill sand is used to comply with these regulations, it must be of an approved type.

Grading of seepage field areas shall be so designed and executed with respect to elevation and slope that surface drainage is off the area and away from all nearby wells.

*Soils with a percolation rate of more than 45 min/inch are unsuitable for subsurface absorption and site modification approved by the Health Officer must be pursued.

Protection of Sewage Disposal Systems

After a seepage system has been approved, the area shall not be disturbed in any way unless alterations are specified in the permit. To prevent compaction, the seepage field area shall be protected against all vehicular traffic. Paving should not occur over a seepage system. No permanent structure shall be built over any portion of a sewage disposal system.

Sewage Disposal Systems in Close Proximity with Lakes, Lagoons, Rivers, or Similar Bodies of Water

No permit shall be issued within 400 feet of a lake, lagoon, river, or similar body of water where the seasonal mean high water table is less than 48 inches below the bottom of the drainage system, unless site modifications as set forth in Section M of these regulations are approved by the Health Officer.

Health Officer May Reject Application

The Health Officer shall have the right to reject an application under the following conditions:

- Where publicly operated sewage system is available.
- Where the septic tank would be inaccessible for cleaning or inspection purposes.
- Where the property served is too small for proper isolation from existing water wells, the premise water well, surface waters, or has insufficient drainage area.
- Where percolation rate exceeds 45 min/inch and site modification plans have not been approved by the Health Officer.

Appeal Board

Any applicant who has been denied a permit to install a sewage disposal system may request a hearing from the Appeal Board. The appeal Board shall consist of the Muskegon County Board of Health and the township supervisor in whose township the permit was denied. A request for a hearing shall be submitted in writing to the Muskegon County Health Department not later than 30 days after the date of the permit denial.

Section L Existing Septic Tanks

When repairs are made to an existing sewage disposal facility, existing septic tanks which are part of such facility, and which do not meet the standards contained in these regulations, may remain in service without modification. This provision shall apply only if the Health Officer determines that such existing septic tanks are capable of performing their intended function in an acceptable manner, and that no dangers to human health and safety, nuisances, or degradation of the natural environment will result from their continued usage.

Section M Elevated Seepage Beds and Perimeter Fill Sand

Site modifications such as cutting, grading, or filling, may be permitted in some cases for the purpose of overcoming soil permeability or high groundwater limitations of natural soils. When elevated seepage beds are used, the perimeter fill sand must extend from the final finished grade and extend in all directions from the seepage bed in a 4:1 slope.

Section N Specific Requirements for a Sewage Disposal System

Construction and Location

Any or all of the following requirements which are applicable shall be compiled within the location and construction of a sewage disposal system:

Inspection of Construction

An authorized representative of the Health Officer shall inspect and

approve the completed facility before backfilling may be started.

1. Size of Septic Tank
To serve the plumbing fixtures and appliances commonly used in a single-family residence:

Number of Bedrooms	Minimum Liquid Capacity
1 or 2	800 gal.
3 or 4	1,000 gal.
5 or more	1,250 gal.

Note: Each additional bedroom requires 250 gallons of additional septic tank capacity. The above septic tank capacities are to be used only with a single-family residence. Larger septic tanks may be required for public and semi-public facilities. Consult the Muskegon County Health Department regarding the capacity of such septic tanks. Two septic tanks will also be required if an ejector pump is used to pump all of the raw sewage from a lower elevation to a higher elevation.

Note: In tight soils of loam or clay, or a combination of sandy loam or sandy clay, or where a garbage disposal unit will be used, two septic tanks in series shall be required.

3. Specifications for Septic Tank Construction

a
1. A rectangular tank should be 2½ times longer than its width A minimum of 4 horizontal feet shall be provided between inlet and outlet.
2. Install a 4-inch concrete floor throughout which supports side walls.
3. All concrete block walls must be constructed with the use of mortar.
4. Inside walls must be sealed with brushed mortar or a block sealing tar compound or equivalent.
5. The sections of a precast concrete tank shall be sealed with a watertight compound at time of installation.
6. All septic tanks must be equipped with an outlet device consisting of a sanitary tee or vented ell or a precast baffle.
7. Inlets and outlets to be properly sealed 360 degrees around pipe.
8. The outlet device must extend downward to approximately 40% of the liquid depth.
9. The tank shall be provided with a minimum liquid depth of 30 inches; 48 inches is preferred.
10. An air space equivalent to 12-15% of the liquid depth shall be provided.
11. Provide reinforced prefabricated covers or reinforced concrete

slabs.

12. Two manholes are strongly recommended in the top of a septic tank. As a minimum, one shall be provided at one end of a septic tank and an inspection opening installed at the opposite end. The manhole shall have a dimension of at least 18 inches.
13. The vertical distance between the bottom of the inlet pipe shall be at least two (2) inches higher than the bottom of the outlet pipe.
14. When the top of a tank is more than 20 inches below finished grade, manhole risers must extend to grade, or approximately 8 inches below finished grade.

b Abandoned septic tanks shall be emptied of their contents and filled with earth or rock.

c Any tank used as a pump chamber and installed within the groundwater or below the mean seasonal high groundwater elevation shall have all seams double-sealed so as to provide a leak-proof receptacle

d When sewage must be pumped from a lower elevation to a higher elevation, the pump unit must be of a design to meet the purpose for which it is used.

4. Isolation Distances - Minimum safe distances in feet

From	Cast Iron Soil Pipe*	Other	Septic Tank	Absorption Field
Well	10	50	50	50
Property	2	5	10	5
Basement Wall	(1)	(1)	10	10
Water Lines	10	10	10	10
Bank or Drop-off	5	10	10	15
Lake or Stream	10	25	75	75

*Pipe materials and type of joints as set forth in Michigan Department of Public Health Policy Letter No. 36-3, issued July 19, 1966, and Michigan Department of Licensing and Regulation, Plumbing Board Letter No. 68-1, September 20, 1968, ca be substituted for cast iron soil pipe and leaded joints.

5. Absorption Area for Disposal Field, Seepage Bed, or Block Trench Based on *Percolation Rate - Minimum required trench bottom area per bedroom.*

Stabilized Percolation Rate (Average time in minutes for water to fall one inch)	Single Family Residence Number of Bedrooms			
Minutes/Inch	1	2	3-4	Each Additional
Subsurface Absorption Bed - Minimum Absorption Area Requirements (square feet)				
0-5	300	400	540	100
6-10	350	450	600	150
11-15	400	540	650	200
16-30	540	650	750	250
31-45	650	750	1000	300
over 45*				
Subsurface Absorption Trenches - *Minimum Absorption Area Requirement* (square ft.)				
0-5	300	350	400	75
6-10	325	375	450	90
11-15	375	450	550	100
16-30	450	550	700	150
31-45*	550	650	900	200
Block Trenches or Precast Units - Length of Trench (feet)				
0-5	45	45	45	15
6-10	50	55	60	15
11-15	60	75	90	15
over 15	Not suitable			

*Soils with a percolation rate of more than 45 minutes/inch are unsuitable for subsurface absorption, and site modification approved by the Health Officer must be pursued.

6. Construction Details of Tile fields or Seepage Beds

Items	Unit	Maximum	Minimum
Number of lateral trenches	–	–	2
Length of trenches	feet	100	–
Width of trenches	inches	36	18
Separation between trench side walls	feet	–	3
Depth of tile lines (top) below finish grade	inches	26	8
Distance between distribution lines in seepage beds	feet	3	3
Slope of tile lines	in./100 ft	4	level preferred
Depth of stone			
Under tile	inches	–	6
Over tile	inches	–	2
Size of stone	inches	1-1½	⅜
Depth of backfill over stone	inches	24	6
Depth to mean seasonal high groundwater below stone	inches	–	30
Depth to mean seasonal high groundwater below stone within 400 feet of surface bodies of water	inches	–	48
Amount of gap between tile in disposal trenches	inches	½	¼

Tarpaper strips 5" X 8" shall be placed over the gap between sections of tile and so placed as to cover the top half of tile.

Other methods of protecting the gap between tile can be approved.

Straw or equivalent shall be placed between the stone and the backfill material.

7. *Construction Details of a Block Trench Absorption System*

Outside dimensions: Length: 33 blocks (standard concrete block
Width: 2 ½ blocks (standard concrete blocks)

	Maximum	Minimum
Depth of stone	*	16 inches
Width of stone	–	8 inches
Size of stone	3 inches	6A
Slope of block trench	1 inch/10 feet	level preferred
Depth to mean seasonal high groundwater below trench bottom	–	30 inches
Depth to mean seasonal high groundwater below trench within 400 feet of surface bodies of water	–	48 inches

Straw or equivalent shall be placed between stone and backfill material.

Tarpaper or equivalent may be used to cover gaps between covers.

Bottom of inlet pipe into block trench shall be a minimum of 16 inches above bottom of trench.

Connections between block trenches shall be made using elbows or tees and shall be made near the downstream end of the failed trench.

*Stone must cover all side openings.

CHAPTER III
REGULATIONS GOVERNING WATER SUPPLIES

Section 1.0 Purpose

The purpose of this Ordinance is to establish an enforcement mechanism for the control and regulation of water supplied to the consumer and residents of Muskegon County.

The purpose of this Ordinance is to provide a means for safe-guarding the environment in order to protect the health and welfare of the consumer and all residents of Muskegon County through the regulation of water supply facilities.

Section 2.0 Authority

This Ordinance is adopted pursuant to the authority vested in the County, by and through its board of commissioners, under Section 46.11 of the Michigan Compiled Laws and pursuant to authority vested in said Board, and its Department of Health, through Sections 333.2435 and 2441 of the Michigan Compiled Laws, being Sections 2435 and 2441 of Act 368 of the Public Acts of 1978, State of Michigan, as amended.

Section 3.0 Scope

This Ordinance shall apply to all suppliers or suppliers of water, all water supply facilities either existent or which may be hereafter constructed except for Type I public water supplies, as defined by Michigan's Safe Drinking Water Act, Act 399 of the Public Acts of 1976, and Administrative Rules, promulgated thereunder, as amended.

This Ordinance shall furthermore apply to all persons constructing a well or installing a pump as defined under Part 127 of Act 368 of the Public Acts of 1978, and Administrative rules, promulgated thereunder, as amended.

Section 4.0 Definitions

Section 4.1 - General Incorporation by Reference

Except as may be otherwise specifically defined hereunder, the terms used in this Ordinance shall convey the definitions as set forth under Part 127 of Public Act 368 of 1978, as amended, and Administrative Rules of the Department of Public Health, as promulgated thereunder, as amended, and under Act 399 of the Public Acts of 1976, and Administrative rules promulgated thereunder, as amended.

Section 4.2 "Water Supply"

For purposes of this Ordinance, "water supply" shall mean a system of pipes and structures through which water is obtained, including, but not limited to, the source of the water, such as wells, surface water intakes, or hauled water storage tanks, and pumping and treatment equipment, storage tanks, pipes and appurtenances, or a combination thereof, used or intended to furnish water for domestic or consumer use.

Section 5.0 Incorporation of Other Regulations

The following State of Michigan Codes and regulations are hereby incorporated by reference into this Ordinance:

- The "Safe Drinking Water Act", Act 399 of the Public Acts of 1976, being Sections 325.1001 through 325.1023 of the Michigan compiled Laws, and the Administrative Rules promulgated pursuant to that Act, as amended.

- Part 127 of Act 368 of the Public Acts of 1978, of Michigan's Public Health Code, being Section 333.12701 through 333.12722 of the Michigan Compiled Laws, and the Administrative Rules promulgated pursuant to that Act, as amended.

Section 6.0 Water Supply Requirements

It shall be unlawful for any person to occupy, or permit to be occupied, any building which is not provided with a safe and adequate water supply.

It shall furthermore be unlawful for any person to supply water in violation of any provision of the laws and regulations set forth in Section 5.0 of this Ordinance.

Section 7.0 Water Supply Construction Permit

Section 7.1 - Requirement of a Permit

No person shall begin construction of a new water supply, or make significant change to an existing water supply, without first obtaining a water supply construction permit from the Muskegon County Health Department. Significant change to existing water supply would include, by way of illustration, but not by way of limitation, replacing the well casing, removing a well casing from the ground, changing aquifers or sources of water, changing screen elevation, deepening or plugging back a bedrock well, changing the pump type, installing a liner pipe, or significantly increasing the capacity of the water supply.

A water supply which has not been in use for more than one year shall not be put back into operation unless it can be shown to be in substantial compliance with this Code.

Provided, however, this Section shall not apply either to a water supply excluded under Section 12703 or Part 127 of Act 368, the same being MCL 333.12703, or to a water supply that is to be used to provide water for plants, livestock, or other agricultural processes, and will not be used to supply water to habitable structures or for human consumption provided that the well and water supply are not physically connected to any habitable structure.

Section 7.2 - Permit Procedure

Section 7.2.1 - Application for Permit

An application for a Water supply Construction Permit shall be made on forms provided by the Health Department. A completed application shall include all information as may be deemed necessary by the Health Department, including at a minimum:

- Signature of the property owner or their authorized representative;
- Information regarding proposed location of water supply facility, relationship of same to buildings, property lines, know, suspected or potential sources of contamination;
- Information regarding property restrictions or limitations.

Section 7.2.2 - Issuance or Denial of Permit

The Health Officer shall issue a Water supply Construction Permit when the information provided indicates that the requirements of this code and/or applicable State statues have been or will be met, and that the quality of the groundwater will not be degraded. The Health Officer may propose limitations or conditions which the Health Officer deems necessary to protect the public health, or groundwater supply.

The Health Officer may deny an application for a Water supply Construction Permit when incomplete or false information has been supplied by the applicant, or when the Health Officer determines that the requirements of the Ordinance and/or applicable State statutes have not or cannot be met. The denial shall be forwarded to the applicant in writing or in person.

The Health Officer shall deny issuing a Water Supply Construction Permit for well installation in areas defined by the Michigan Department of Environmental Quality (MDEQ) as "Facilities" under Part 201, sites of environmental contamination and/or Part 213, Leaking Underground Storage Tank (LUST) facilities. No well permit variance shall be given without written approval from MDEQ.

Section 7.3 Effect of Issuing Construction Permit

The issuance of a Construction Permit shall serve as authorization to the permittee to construct the proposed water supply in accordance with the application and any conditions or limitations imposed in the Permit. Such authorization shall not, however, relieve permittee of any obligation or limitation that may otherwise be imposed under any other applicable law, nor shall issuance of a construction Permit be deemed in any way to authorize permittee to use the water supply except for testing purposes.

Section 8.0 Approval to use Water Supply

Section 8.1 Unlawful Use of Water Supply

No person shall use, or permit use, of a water supply subject to the permit requirements of this Ordinance except for testing purposes, unless and until the construction and installation of same has been approved by the Health Officer.

Section 8.2 Issuance of Use Permit

The Health Officer shall, upon determination that the water supply has been constructed and installed in accordance with Construction Permit requirements, conditions and limitations, issue a Use Permit. Such Use Permit may be issued conditionally pending receipt by Health Officer of a completed "Water Well and Pump Record" prepared by the well driller and/or pump installer, as applicable.

The Health Officer may elect to perform an onsite inspection prior to issuance of Use Permit.

Provided, however, Health Officer shall not issue a Use Permit until Health Officer has received copies of the results of the analysis of water samples indicating that raw water quality meets minimum public health standards. Water sample analysis shall include coliform bacteria and any other parameter deemed necessary by the Health Officer. Analysis of water samples shall be performed by laboratories certified by the Michigan Department of Environmental Quality. All water samples shall be collected in accordance with protocol established by Health Department.

Section 9 Deviations

The Health Officer may issue a deviation from the requirements set forth herein, or incorporated herein by reference, provided such deviation does not result in a violation of State Law, if the spirit of intent of such requirements and laws are observed and the public health, safety and welfare are assured.

Section 10.0 Application and Approval Fee

A fee to be determined by the Health Department shall be paid by any person for each water supply facility subject to the permit and approval requirements of this Ordinance. Such fee shall be paid on date of application for permit which shall be non-refundable. No permit shall be issued prior to satisfaction of the fee payment requirement.

Section 11.0 Enforcement

The Health Officer and subordinates shall be authorized to administer and enforce this Ordinance and to pursue legal action as may be necessary and appropriate, to assure compliance with same.

Section 12.0 Penalties

Any person who shall fail to comply with the provisions set forth herein shall be deemed guilty of a misdemeanor and may be punished by a fine of not more than $200 or imprisonment in the County Jail for not more than 90 days or both, in the discretion of the Court.

Section 13.0 Incorporation into Muskegon County Sanitary Regulations Amendment and Repeal

Section 13.1 Incorporation

This Ordinance, in its entirety, shall be incorporated upon adoption into that Ordinance and Regulatory document entitled *"Muskegon County Sanitary Regulations"*, effective October 14, 1984, constituting chapter III, entitled *"Water Supply"*.

Section 13.2 Amendment

By adoption of same, the Ordinance entitled "Muskegon County Sanitary Regulations, Effective October 14, 1984", is amended.

Section 13.3 Repeal

Chapter III of the "Muskegon County Sanitary Regulations, Effective October 14, 1984", in previous form, is hereby repealed.

Section 14.0 Savings Clause

Should any part or provision of this amendatory Ordinance be deemed of no force and effect, then any part or provision not so determined inform shall remain in full force and effect.

Section 15.0 Notification

At least (30) days prior to any modification, lapse or revocation of Chapter III, Regulations Governing Water Supplies, the Health Department shall notify the Michigan Department of Environmental Quality (MDEQ) or a successor agency to the MDEQ.

Section 16.0 Effective Date

These regulations shall become effective thirty (30) days after the date of publication.

Adopted this 14th day of September, 1999.

[Chapter III, Notice of Adoption, published September 30, 1999, effective October 29, 1999].

CHAPTER IV
GARBAGE, RUBBISH AND TRASH

Section A General Definitions

Words and Terms

The following words and terms used in this chapter, unless otherwise expressly stated, shall have the following meaning:

"Garbage" shall mean rejected food wastes including waste accumulation of animal, fruit, or vegetable matter used or intended for food or that attend the preparation, use, cooking, dealing in or storing of meat, fish, fowl, fruit, or vegetable.

"Rubbish" shall mean tin cans, bottles, paper cartons, rags, discarded clothing, discarded utensils, discarded containers, sweeping, glass, crockery, nails, tine, wire, light bulbs, signs, advertising matter, and such other material as are normally discarded from a household. This does not include discarded household furniture and appliances or building wastes.

"Trash" shall include such items of discard which are not normally associated with residential usage; also, discarded household appliances, dismantled vehicles or their parts; discarded or dismantled machinery or tools and such, other items that shall constitute a health or safety hazard or menace to persons residing in the neighborhood.

Section B Garbage and Rubbish Storage

- No person, firm or corporation shall store garbage or rubbish on any premises unless such materials be completely contained within watertight containers, having a capacity of not less than ten (10) gallons, nor more than thirty-four (34) gallons with sides tapered to an enlarged opening and equipped with handles and a tightly fitting cover, except that plastic garbage and rubbish bags shall not be stored outside awaiting collection by a refuse service for a period exceeding twelve (12) hours. Putrescible wastes shall not be stored more than sever (7) days.

- The owner of every multiple dwelling, and in the case of private and two-family dwellings, shall keep clean and in place, proper watertight containers having a capacity of not less than ten (10) gallons, nor more than thirty-four (34) gallons with sides tapered to an enlarged opening and equipped with handles and a tightly fitting cover. Putrescible wastes shall not be stored more than seven (7) days.

- Containers used for the storage of garbage or rubbish shall be maintained in a clean and sanitary condition, and shall be tightly covered except at such times as material is bing placed within or removed from containers.

- Containers for garbage and rubbish of greater capacity than thirty-four (34) gallons of a design and construction specifically approved by the Health Officer of the Muskegon County Health Department may be used for the storage of garbage and rubbish within Muskegon County, Michigan.

Section C Trash Storage

Storage, deposit or accumulation of trash is prohibited on any lot or parcel located in Muskegon County.

Section D Transportation

No person, firm or corporation shall transport garbage, rubbish or other waste materials upon any street, alley, road, right-of-way, or highway in Muskegon County in any vehicle unless such vehicle is so constructed and maintained as to prevent offensive odors or exhalations therefrom, and leaking, sifting, dropping, spilling, or blowing of the contents thereof upon any street, alley, road, right-of-way, highway, public or private property.

Section E Disposal

No person, firm or corporation shall deposit any garbage, trash, or other waste matter upon any road, street, alley, highway, right-of-way, or within any park, stream, lake, or river in Muskegon County.

Disposal or deposit of garbage rubbish, trash and other waste material shall be permitted upon a site licensed under Act 641 of the Public Acts of 1978 and Regulations.